STANDARD COSTS IN MANUFACTURING

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PREFACE

How much is it necessary for the business manager to know about methods of finding the cost to manufacture a product or products? Should it be left in the hands of competent cost accountants or is it possible for one in a managerial position to learn in a reasonably short time how the system employed actually works, and so assure himself that it is a good system?

It would seem as though a comprehensive outline of procedure accompanied by exemplar illustrations should accomplish this feat. It is apt to be rather dry reading for one who is not familiar with the various procedures, but it is practically impossible to know what it is all about without following these interrelated processes of thought on the subject, which includes, of course, a study of the details involved.

This paper is written primarily to give the business manager some knowledge of how the cost to manufacture is derived. It is written from the cost accounting point of view, but with as much red tape and detail eliminated as is possible and yet containing all the necessary information for obtaining accurate costs. Since the details of procedure are not all omitted it also serves the accountant in as much as it endeavors to present approved methods of accounting for and arriving at the cost to manufacture.

Standard costs are discussed because it is being increasingly felt that this method of arriving at costs is the most dependable in almost every situation. Standard costs, too, have a range of application that is practically universal, which is not true of any other system.

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INTRODUCTION

In presenting this study with the above title there is a possibility its scope may be misconstrued. It therefore seems advisable to define the limitations of the subject and at the same time prepare the readers mind for that which is to follow by outlining the reasons why certain steps have been taken.

All of the methods herein enumerated and explained could not be applied to all manufacturing plants. In general they are designed to fit the needs of a plant using the shop order system of routing and planning. They could be most efficiently applied in a factory engaged in producing articles which require the job cost system rather than process costs, i. e., articles which are separate from one another throughout their process of manufacture. Nevertheless the broad principles are also applicable to process costs.

THE ASSUMPTIONS

A number of things are assumed. The first of these is that the plant has sales organization. This may not be so and the entire production may be marketed thru jobbers. Such a procedure would not affect the system as long as the amount to be produced can be estimated closely. It is also assumed that there is a good system of production planning in force. This is necessary to give a starting point for all manufacturing procedure. In this department all shop orders, or orders to manufacture, originate.

THE SUBJECT MATTER

To the best of my knowledge no single book on standard costs gives all the procedure for complete standards and the accounting threrfore. Most of them ignore the Bedaux System of labor

standards, i. e., the use of time standards rather than piece rate standards. It is intended that this thesis should present complete standards in every phase of the system.

Most of the recent text books on the subject of standard costs devote the greater part of their pages to the manner of setting up burden figures and to the many complicated formulae for the analysis of variations from the standard. That no modern business man could or would take the time and effort to delve into these complications seems to be obvious. That some cost systems have used, and continue to use complicated formulae and forms is also true, and their use is limited to the trained cost accountants who are in daily contact with the system. Even so, it may be hazarded that in the midst of the complications and evolutions necessary that at times the main object is either lost, forgotten, or not attained.

FUNCTIONS OF A STANDARD COST SYSTEM

A standard cost system must do three things; it must show all deviations from standard; it must show those deviations at regular intervals and as soon after they occur as possible; and it must show the reason for the deviations.

There are only three factors in manufacturing costs as they are usually classified; and these are: Material, Direct Labor and Overhead or Burden. The setting and maintaining of standards for these factors is our main consideration. Material standards are the engineers conception of the amount of material necessary to produce a perfect article. Any amount used that is more than the standard represents a loss, and should be analyzed as to cause, and the causes should be corrected. The price of material must be known in advance or must be estimated according to the judgment

of the purchasing agent. Any variation in price represents a gain or loss that has nothing to do with the efficiency of the manufacturing plant and should be set apart from manufacturing costs. Labor is paid at standard so there will be no variation there. The method of setting the standard and the method of accounting for labor as set forth in this thesis is a modification of the Bedaux system. Overhead, or Burden can also be standardized. To do this the component parts must be analyzed and all unnecessary cost eliminated.

IN PROCESS ACCOUNTS

In an endeavor to eliminate "In Process" accounts instead of making an entry charging the Material in Process accounts and crediting the Materials inventory accounts, whenever material is put into process no entry is made at all until the articles are finished or until they have reached a stage that may be called semi-finished and are to be stocked until requisitioned. At that time the entry is a charge to Finished Product and a credit to Materials, Direct Labor and Burden according the prescribed standards which have been established. If more or less than standard materials have been used (See chapters on Material) that has been accounted for thru the systems of requisitions and an adjustment must be made to the account, "Gain or Loss on Materials".

The purpose of including this subject in the introduction is to pave the way to an understanding of this elimination by showing how it will be operated, and the reasons why it is thought to be worthwhile. Let us first outline the procedure in handling materials records in the various places where they must be kept for control purposes: (See chapters on Material for detailed information.)

A. Materials purchased.

1. Enter on general ledgers at standard prices from the invoice.
2. Enter on subsidiary record in the Purchasing Department at standard (also at actual for record purposes).
3. Entered as received as to quantity only, on inventory accounts in Planning Department.
4. Entered on Stores room Record of Materials as received as to quantity only.

B. Materials put into process. (By requisition only).

1. Entered as a credit to the inventory accounts in Planning Department as to quantity only; in the Purchasing Department after pricing at standard; on the Stores room records as to quantity only.

C. Product Finished.

1. Entered in Cost Records as a charge to Finished Product Materials from the Compilation of Standard Costs at Standard, and as a credit to Materials (thru the General Ledger Control) with the accompanying charge or credit to Gain or Loss on Materials as indicated by the requisitions on that particular shop order.

D. End of Accounting Period: Work-in-Process Accounts.

1. Charge Work-in-Process and credit Materials from requisitions in the In-Process file in Cost Department including all requisitions whether over or under the standard.
2. This entry to be reversed at the beginning of the next accounting period.

What are the net results of such a procedure? When a physical inventory is taken (which is usually done) at the end of the

accounting period, the actual inventory must check quite closely with the book figures. It must check with the Stores room records which in turn must check with the records in the Planning Department and in the Purchasing Department. If these can be checked with some degree of accuracy then without a doubt the General Ledger Materials accounts can be checked as closely. So it can be seen that adequate control is established.

There are two advantages: (1) All in-process entries as material is put in process are eliminated with the resulting saving in time; (2) the Loss and Gain on Materials Standards account will require no adjustment for In-Process materials since Work-in-Process is set up at actual with only an adjustment for standard price variations.

CHAPTER I

COMPILATIONS OF STANDARD COSTS

The first step in a Standard Cost System in manufacturing is a Compilation of Standard Costs for each product. This compilation shows the material and labor costs of each part, of each assembly (if there is more than one), and of the final assembly. Standard Costs per 100 Parts or Assemblies (Form #1) and List of Parts and Assemblies (Form #2) show the two forms necessary to carry out the compilations.

The Standard Costs per 100 Parts or Assemblies (Form #1) has a particularly widespread use in standard costs. It is adaptable to the method of machine rate burden or departmental burden as well as to an over-all burden rate. Each part has a separate card as does each assembly. The totals of Form #1 cards are carried to the List of Parts and Assemblies card (Form #2) if the process calls for sub-assemblies and so ~~the~~ to the final assembly.

These cards are adaptable to a continuous process method of manufacturing wherein the direct labor in each process can be recorded and standardized. For example, the manufacture of garments from the yarn---until the yarn becomes cloth the method of manufacture is what is known as continuous process, and while each kind of material and grade of cloth can be distinguished each hundred yards of cloth contains what will later be distinguishable as separate garments, yet while still cloth the labor expended in processing must be distributed over the whole "batch" of material. This form is not adaptable to such continuous processes wherein one batch is indistinguishable from another or where direct labor cannot be standardized.

Use of Form #1

Altho the form is almost self-explanatory there follows an outline of the use of the form explaining the designation of space.

Description: Name of the part or assembly.

Date Compiled: Signifies that the standards are correct on this date.

Number: The part or assembly number to be used when transferring the data to Form #2.

Operation Sequence: Each part or assembly operation should be listed in its logical sequence on the card.

Operation Number: Operations should be numbered in their logical sequence. If there are sub-assemblies before the final assembly it may be well to prefix a letter to the operation number--all part operations having the same prefixed letter to go into the same sub-assembly.

Description of Operation: This description should be complete enough to identify the operation when coupled with the description of material below.

Price Rate per 100: For use when labor for the operation is piece rate. Under the Bedaux Systen this will be set up as a standard time allowance cost.

Standard Hours per 100: This calls for the labor standard of each operation in tenths of hours or B's allowed under the Bedaux System.

Material:

Description: Stock Room symbols will usually suffice.

Quantity per 100: Denotes quantity of material necessary to produce 100 pieces. It is the standard.

Standard Price: Standard material price rate at standard quantity.

Standard Amount: Extension. Total of this column indicates standard material cost for the part or assembly per standard.

Summary of Costs: This section summarizes material and labor costs for the part ~~of~~ or assembly described above it, ~~and by~~ by means of carrying forward like summarizations from lists of parts and assemblies (see description of Form #2 below), at the final assembly shows the total standard material and labor cost. To this is added the burden rate to obtain the total standard cost to manufacture.

Burden: If it is desired to use either departmental or machine rate burdens then the burden rate will be included on each part or assembly card. If an overall rate is used then the burden will only be added on the final assembly card. Burden is entered as a labor item on the Standard Cost Compilations.

Use of Form #2: For collection of standard cost of parts and assemblies for assembly purposes.

Part Number and Description: Transferred from Form #1.

Number Required: If more than one of each kind of part is required for final assembly it should be stated here.

Total Cost per 100: Since standards are set for 100 parts or assemblies the costs must always be carried forward in this manner. The total of the labor and material costs are thus carried forward to the final assembly.

While it may seem that the setting up of Standard Cost Compilations at the beginning of this study is somewhat like putting the cart before the horse the object is to make a place for the information which is to be obtained in the manner described hereafter.

CHAPTER II

THE SALES BUDGET

Most modern manufacturing businesses having their own selling forces attempt to forecast sales. Many base production on forecasted sales in one manner or another. Relatively few go into that phase of sales management with the sole idea of establishing a basis on which standard costs are set and maintained. This is not surprising in view of the fact that "standards" as rigid foundations to be adhered to strictly has not yet been "sold" to ~~very~~ many manufacturers. This thesis carries the "standards" idea from beginning to end, and therefore, the idea of the sales budget as a set of standards must be its first consideration.

FORECASTING SALES

Just before the beginning of each period an analysis of the sales possibilities and probablities should be made. It must be a thorough going piece of business. Production will be based on it. The whole structure of the standard cost system will rely on it for accurate information on which standards will be set. As it varies up or down from actual sales so will the standards vary from the actual costs. That it will not exactly equal the actual sales is a certainty, but if it can and does approximate the actual, it will be possible to know in advance what the cost of the products by units will be.

THE PERIOD OF TIME

The period of time it should cover is goverened by two things: (1) The frequency with which the books are closed and (2) the longest period of time over which the sales budget may be

set and yet produce a close consistency with the actual sales. It probably could not be set over a period of more than one year and six months is preferable usually. If the books are only closed for profit taking purposes once a year then it must be set up for that period of time. Another factor which will greatly influence the setting up of an accurate sales budget is the type of business and the possible necessity of manufacturing some time in advance of sales. In most seasonal businesses the goods are manufactured about six months in advance of sales. In some types of businesses the period is longer, in others it is shorter. The effect may be the necessity of setting a sales budget approximation for the period beyond the primary period of one year or six months. This approximation would be adjusted and compared when the regular "period" budget has been compiled.

ALLOCATION OF SALES

Having determined the length of time over which the sales budget is to extend, the next step is to allocate to each salesman the quantity of each product it is reasonably to be expected that he can sell. This is derived through a thorough analysis of sales conditions in each territory, a study of the trend of economic events and the records of sales by salesmen in previous years. The quota alloted to each salesman may not be known to him. That is a matter to be left in the competent hands of the sales manager.

SALES BUDGET FORMS

Form #19 shows the compilation of sales in total by months and by products. Forms for the compilation of sales by salesmen have such a wide variety of considerations and usage that they are left to the discretion of the user. The columns headed "Material"

and "Labor" are taken from the compilations of Standard Costs Form #1 which are held in the cost department. Material and Labor costs are reported on the Sales Budget so that manufacturing costs by products may be compared with selling costs by the sales department. Labor, on the Compilation of Standard Costs, includes burden as we have seen in a previous chapter.

CHAPTER III

MATERIALS PURCHASED

THE PROCEDURE

An efficient manufacturing plant is governed in its production by the quantity which can be sold. The kind and quantity of material to be purchased is determined by estimated production. ~~So~~ Let us follow the general routine in the office of a firm engaged in the manufacture of a commodity with its own sales force working thru branch offices in various parts of the country. We shall not touch on such departments in the organization as credit, billing and sales ledger, nor any part of the selling organization other than to assume that they are present and functioning. We are going to deal, however, with those departments directly connected with the manufacture of the commodity, the expense of which is charged to overhead or burden in the manufacturing costs.

FINISHED STOCK RECORDS

When an order is received it goes directly to the order department where steps are taken to see that it is filled at the earliest possible moment. A duplicate of the order is ~~then~~ sent to the stock records department. The function of this department ~~as its name implies~~ is to keep an accurate record of the finished stock on hand, which it does by means of a card index system. There is maintained on each size, kind, and color of the commodity a separate card with the amount on hand and the minimum advisable to be kept on hand. When the order is posted to this card it becomes obvious immediately whether more of that particular kind, size or color should be manufactured. In connection with minumums, a separate department, usually referred to as sales analysis, utilizes sales figures for prior years together with present sales trend information

and thereby produces information upon which the management determines the advisable minimum stock on hand figures for the period under consideration.

PLANNING DEPARTMENT FUNCTIONS

As stock on hand falls below the minimums the planning department is notified. It is the function of the latter department to plan the plant operations so as to bring the stock on hand up to the minimums which should be kept on hand. Strictly speaking, this is not always a cut and dried procedure as seems to be indicated by the above statement, because the planning department may, at certain periods, be required by the production manager to plan the manufacture of stock in anticipation of sales which market conditions indicate will soon follow. In general, however, finished stock on hand is kept up to the required minimums and manufacturing plans are based upon these minimums.

~~Thus~~ In this manner, the planning department has at hand the requirements and proceeds to plan the manufacture of the commodity or commodities. The planning department has also a complete inventory of raw materials and in some cases, ~~where it is~~ when necessary, an inventory of materials which have been partially processed. The planning department usually schedules plant production three weeks ahead, altho sometimes further ahead if it is thought necessary. As the work is planned, formulae, based on predetermined standards as to the material requirements of the various kinds and sizes of the commodity about to be manufactured, are applied against the materials on hand, and it becomes apparent that certain materials must be ordered. Similarly to the finished stock record cards, the material inventory shows a minimum of material which should be kept on hand. As orders to manufacture are issued by the planning department and

material charges are at the same time made on the inventory cards, the balance of material on hand eventually falls below the required minimum.

ORDERING OF MATERIALS

Purchase requisitions (Form #3) are made out for materials to replace that which will be used in the manufacture of the commodity according to the shop orders issued by the planning department. Purchase requisitions are made in triplicate, one for the planning department files which is released to the general files when that department is notified that the materials have been received by the receiving report from the store rooms, at which time the materials are posted to their perpetual inventory cards, duplicates of which are kept by the stores clerk. The duplicate and triplicate purchase requisitions go to the purchasing department, and after being approved by the purchasing agent, purchase orders (Form #4) are issued in triplicate giving the name of the firm that will fill the order, the amount, price, terms etc. Purchase Orders must be approved by one of the management, usually the treasurer. Two copies are sent to the vendor and one copy is retained in the purchasing department files.

When the invoice for goods purchased is received it is sent by the mailing department to the accounts payable division of the accounting department where terms are noted and compared with those given by the purchasing department as applicable to that particular invoice (kept in card files in the accounts payable department) and if the bill must be paid immediately it is put on a calendar at the due date and called for at that time. Each invoice is stamped with a rubber stamp (Form #5) by the accounts payable department and sent to the purchasing department where the details called for on the rubber stamps are filled in and the invoice is approved finally by

the purchasing agent for payment.

CHARGING OF INVOICES

When the invoice is received in the purchasing department the purchase order is taken from the files and compared with the invoice. If the invoice is correct in every particular, ~~then~~ the purchase order is checked off but attached to the invoice so that each person who must approve the invoice will know that it has gone thru the regular channels and is in good order. On all inventory accounts the standard amount must be figured and filled in on the rubber stamp (Form #5). On expense invoices the standard amount is the invoice amount. The invoice is figured, terms approved, marked received from receiving reports from the store room, price approved, purchase order number filled in, and charged in the purchasing department. If the invoice is a charge to a material account it must be entered on the perpetual raw materials inventory accounts kept by the purchasing department. The invoices are entered in two amounts, the actual cost and the standard cost. This is done in order to be able to determine the actual cost of inventories on hand for balance sheet and profit or loss purposes. This procedure also simplifies the operation of determining actual costs for the estimates needed in setting up standard costs for the next accounting period. ~~These~~ The inventory accounts are credited for material put into process thru the materials requisitions, the originals of which are all sent to the purchasing department by the supplies clerk.

ENTERING OF INVOICES

All invoices are sent to the auditor for approval with the purchase orders attached and hence to the accounts payable department to be paid. The invoices are entered in voucher registers as follows: The amount of the invoice as a credit to accounts payable, the

standard amount in the standards column. The standards amount is distributed to the accounts charged. At the end of the month or the posting period the difference between the standard amount and the credit to accounts payable is entered as either a debit or a credit to "Loss or Gain on Materials Purchased."

LOSS OR GAIN ON MATERIALS PURCHASED

The account "Loss or Gain on Materials Purchased" shows how effective the purchasing department is, and how well they have been able to predict market prices. It is, after all, a manufacturing account and should be considered as either a deduction from, or an addition to the cost of goods manufactured. It appears on the profit and loss statement in this manner. It should be adjusted to the materials on hand for inventory purposes as well as the materials in process inventory when the books are closed. Reversing entries should be made at the beginning of the next period to return the account to its normal position thru the inventory accounts. When adjustments are made in standard material prices at the beginning of the period the account would stand the variations thus caused in the status of the raw material and materials in process inventory accounts.

CHAPTER IV

ESTABLISHING MATERIAL STANDARDS

DETERMINATION OF STANDARD PRICES

In order to determine the standard prices of materials the purchasing department submits at the beginning of the cost period a schedule comprised of the following items:

(1) Cost of materials on hand (actual)

(2) Present market prices

(3) A comparison, with averages, of actual and standard prices for the previous accounting period.

(4) Estimates of the probable condition of the market thru the coming accounting period.

With these factors given, standard material prices are set for each raw material or partially processed material to be purchased. The actual setting of the material standard prices is a matter of judgment and is best done by a conference of the purchasing agent with the production manager and the ~~chief~~ cost accountant. The quantities to be purchased will, of course, affect the prices which can be obtained, and reference should be made to the sales budget for the period as to the quantity of goods which will probably be manufactured. Material cost standards should not be set for too long a period of time. If the books are closed semi-annually, ~~then~~ the standards may well be adjusted at the beginning of each bookkeeping period. They should be adjusted at least once a year.

RECORDS OF STANDARD MATERIAL PRICES

Standard material prices are recorded on the forms for the Compilation of Standard Costs which are kept in the cost department. Standard material prices are also listed with the purchasing

department for invoice charging purposes. Whenever a standard price is changed there must be new Compilation of Standard Costs forms drawn up for the articles affected thereby.

MATERIAL QUANTITY STANDARDS

Standards of the quantity of material used are set by the engineering and production department. It is not our purpose to go into the methods of determining such standards. We shall merely give the method of accounting for the material standards and the actual quantities used. Let it suffice ~~for our purpose~~ that the standard quantities should be a constant factor which rarely needs to be changed. Material quantity standards are usually set for a given number of pieces either 1, 10, 100, or 1000 based upon the number of the commodity usually manufactured ~~put thru~~ on a shop order. ~~to be manufactured~~. The material quantity standards are also entered on the compilation of costs.

PRODUCTION PROCEDURE

The planning department sends the orders to manufacture to the plant office on a cycle sheet (Form #6) where shop order tickets are made out for each order. The cycle sheet contains the shop order numbers and (under Form and Code) the style or kind of the commodity to be manufactured and the quantity. A shop order number is issued for not more than a certain quantity, usually the standard quantity. If, for example, it is necessary to manufacture five hundred garments of a certain kind probably there would be ten shop orders with consecutive shop order numbers for fifty articles ~~garments~~ each. This simplifies handling as well as bringing about the manufacture of the goods in standard quantities. The shop order number has three significances, the first digit in the series indicates the plant number if there is more than one plant, the second two digits

indicate the cycle or week the work is to be done in (there being fifty-two in succession under this system) the remaining digits indicate the real shop order number and may run from one to nine thousand and nine hundred ninety-nine in each week, at each plant. The form and code number in a similar manner may be given whatever significance is necessary to bring about distinction of style, size or kind or product.

An example of a shop order number might be 223056. Interpreted this would mean that it was the 56th shop order issued at plant #2 to be manufactured in the 23rd week of the year. An example of a form and code number might be 4037/1025$\frac{3}{4}$ which could be the description of a garment to be made. 4037 could indicate the kind of cloth to be used. 1025$\frac{3}{4}$ could indicate the style of garment to be made. The significance of the $\frac{3}{4}$ in this case (the garment happened to be underwear) was that it indicated three quarter length legs and sleeves.

SHOP ORDERS AND SPECIFICATIONS

The shop order ticket (Form #7) is a set of labor coupons or labor tickets which are clipped off as each kind of work is done on that particular shop order. Each labor coupon carries the shop order number, form and code number, quantity, job number or letters and the labor time allowance, which is standard. Material specifications (Form #8) and material requisitons (Form #9-White) are issued at the time the shop order tickets are issued as well as instructions other than standard for the operations called for by the form and code number. The material requisition is made out in duplicate and for the amount of material called for by the standard material specifications for the form and code number to be manufactured. Some difficulty arises on requisitions for material on orders for any amount other than the standard quantity. In

these cases the proportionate amount of standard material must be requisitioned.

The standards must be as rigid as possible, making ~~only the~~ allowance only for spoiled work considered necessary from previous experience. Whenever it is necessary to issue material requisitions for any amount over that required by the material standards this requisition must bear the approval of the department superintendent.

MATERIAL REQUISITIONS

The material requisitions (original and duplicate) are taken by the stores clerk whose first duty is to note that the shop order number and form and code number are on the requisition and that it has been properly approved by the plant office. He retains the duplicates for his files after giving each requisition a requisition number. Requisition numbers follow consecutively in the order the requisitions are received by the stores clerk. The original goes to the cost department for their records.

Whenever it is necessary to requisition more material than the standard on an individual shop order, a yellow requisition must be made out in duplicate which goes thru the regular channels. Each yellow requisition must bear the cause or reason for the necessity of ordering more material than the standards call for. For no reason should additional material be requisitioned on the regular white requisition or be added to the standard on the original requisition. When shop orders are put thru to manufacture goods on which there has been no standards set, either because they have not been manufactured before, or any kind of special orders, then the material requisitions should be made on the yellow requisitions.

If material is returned to stores it must be accompanied by a pink "credit" requisition, which is the same in every respect

as (Form #9) except for the word "Credit" and its color, and must give the shop order and form and code number on which the materials were originally requisitioned but not used. The credit requisition goes thru the same channels as the regular requisitions. It must also give the reason why material was returned, if the reason is discernable.

CHAPTER V

COST ACCOUNTING FOR MATERIALS

MATERIAL REQUISITIONS

The cost department receives three kinds of requisitions: the standards white, the over-the-standards yellow, and the pink credit requisitions. All the requisitions are filed by shop order numbers with no distinction as to color in a file of in process materials. As each shop order is completed and the cost department notified to that effect, the material requisitions and credits bearing that shop order number are removed from the in process file and placed in the finished product files. Either before or during the period they are in the process files each material requisition must be priced according to the materials standard price list on file in the cost department. When the books are closed it is a simple matter to determine the cost of materials in process by adding the requisitions in the process files. The materials in process inventory accounts would have to be adjusted thru the "Loss or Gain or Purchases" account for balance sheet purposes (see chapter III on materials). It would be necessary at that time to segregate the requisitions by materials on a work sheet in order to properly credit the materials accounts.

FINISHED PRODUCT FILES OF REQUISITIONS

When the product or products have been completed the finished product files hold the material requisitions with the amount of material required thereon. If, on a single shop order, it was necessary to use only the standard material requirement and no more and no less, that is, if ~~we have~~ there is only a white material requisition, then it is known that the standard is actual as to quantity and as

to price (since price variations are taken care of on the general books). From the point of view of cost records we have shop orders with material at standard and shop orders with material at either more or less than standard. Obviously if material is at standard the shop order needs no particular analysis. It is only necessary to record standard costs in the cost records.

ANALYSIS OF MATERIAL VARIATIONS

Shop orders on which material varied from standard ~~should be~~ are analyzed. These should be grouped by form and code number in so far as possible and a weekly analysis made. Form #10 shows how this weekly analysis may be made. It gives the causes for materials over, and the department at fault, if the cause can be placed in a department. Shop order numbers are essential to trace recurring causes. Causes should be separated into groups which have some similarity; such as spoiled work-operator at fault, spoiled work-machine at fault, special work, repair work (when additional material is needed to correct slightly spoiled work), etc. This is best done by dividing the Analysis sheet into sections horizontally as pictured. The yellow and pink requisitions only need be posted to this analysis sheet since the standards can be picked up from the compilation of standard costs cards, or if the method of posting makes it more simple, the standard can be posted from the white requisitions.

The analysis of material variations can be arranged to suit the needs of the manufacturing plant. It might be of greater benefit to group the variances under kinds of materials. Or again, there may be so many products manufactured that it would seemingly be impossible, or at least of little benefit to group the variances in either of the ways mentioned above, but they

could be grouped by causes and departments at fault, and a more thorough analysis made whenever necessary.

TABULATING OF MATERIAL COSTS

The natural manner of tabulating standards and material overs for the purpose of recording on the cost records is in the same manner that sales are recorded for the general ledgers. That is, since sales must be recorded either by lines or products and grouped for convenience in handling, so will the material costs (and of course, the labor and burden) have to be grouped. The fact that each material requisition in the finished product files bears a form and code number which immediately distinguishes it, makes possible the grouping of material requisitions in whatever manner desired. The entry would be a charge to Finished Product by lines or groups and credits to the various material accounts. This applies only to white material requisitions and may be (and usually should be) done by tabulating the quantity going thru on each form and code number by hundreds and multiplying by the standard material costs as shown on the Compilation of Standard Costs forms. At the same time, and in the same way, the entry for standard labor and burden may be put thru. Thus, except at the time of closing the books, no materials, labor or burden in process need be set up on the books.

TABULATION OF MATERIAL VARIANCES

The material variances are tabulated in total only from the yellow and pink requisitions and a charge or credit to "Loss or Gain on Material Standards" is put thru, crediting or charging the various materials accounts. The analysis of this account is taken care of thru the chart called Analysis of Material Variations as explained above. A monthly deliveries report of goods put in process and another of goods finished is sent to the purchasing

department, and a copy to the planning department for their inventory records.

PROCEDURE VARIANCE

In certain kinds of businesses or under certain conditions it may be well to alter the procedures to take care of any complications which might arise. For example, if material in process was sold before being completed it would be necessary to consider that the goods, or partially completed product, were finished, charge them into finished product at standard cost and if there were any material variances up to that time it would be necessary to adjust them thru "Loss and Gain on Material Standards". When the entry for the sale came thru it would credit "Finished Product" and "Loss or Gain on Material Standards" and whatever account used for such sales for the profit derived (probably profit and loss, or an adjustment account, unless there were many such sales, in which case there should be a sales account and no adjustment made to "Loss or Gain on Material Standards") at the time of the sale. A similar adjustment would have to be made for labor and burden on such sales.

MONTHLY JOURNAL ENTRIES

Each month, journal entries should be made for the materials used in crediting the proper "Finished Product" accounts. After requisitions have been used for the monthly journal entries they should be kept in the cost department in "Finished Product" files, and filed by shop order number, the white, yellow and pink requisitions on each shop order number being kept together. Before being filed in this manner, however, they should be arranged by requisition number and each requisition accounted for. If any are missing it is easy to trace them since the stores clerk has a duplicate of each, and keeps his duplicates in a file by requisition number.

CHAPTER VI

SUPPLIES

ACCOUNTING FOR SUPPLIES

In many manufacturing plants, supplies represent all kinds of miscellaneous material, no part of which could be accurately charged to a particular shop order number. For example, glue used in a chair factory. Such materials may or may not be established in separate accounts, depending on the quantity used and the ease with which it can be ~~kept track of~~ accounted for by the stores clerk. In any case there ~~must always be~~ is usually a "Supplies" account for most of the sundry materials which are kept by the stores clerks. These should be charged directly to the Supplies accounts on the invoice with no adjustment to "Loss and Gain on Materials Purchased" since there would be no price standards on such materials. As with other materials they may only be taken from the stores room by submitting a supplies requisition, which is the same in every respect as the material requisition (Form #9) except for its heading, "Supplies Requisition", and the fact that its color is green and not white, pink or yellow. Supplies requisitions also have a separate set of requisition numbers. Each requisition must designate the department in which the material is to be used. In some instances it may be advisable to require the explanation for the use of certain kinds of material.

GENERAL USES OF SUPPLIES REQUISITIONS

Supplies requisitions may also be used to obtain office supplies from the stores room since it is not usually good practice to keep all office supplies for a considerable period of time in the place they are to be used. ~~Also~~ The office department using the supplies would not, under this plan, be charged with the supplies until they

were to be used. A further use of these requisitions might be for the transfer of machinery, equipment, or furniture and fixtures from one department to another, or from one plant to another. Its use for this purpose insures a memorandum of such changes which must eventually come to the attention of the accounting department because all supplies requisitions must be finally audited by the accounting department to insure correct charging or correct usage, and at that time a transfer would be made on the general books if necessary. Requisitions are audited each month by ~~a responsible person in~~ the accounting department. If the requisitions are used for machinery and other transfers they may also be used as a memorandum for machinery sold, or for any kind of petty sales in which case they would bear the credit to the account to which the machinery, or other goods, were originally charged and the adjustment to Profit and Loss.

When it is found advisable to set up separate accounts for materials such as glue used in a chair factory or buttons and trim material used in a garment factory the supplies requisitions may still be used. The credit being to the account to which the material was originally charged. The manner of handling such material depends to a large extent on the quantity required to complete a standard quantity of the product and the ease of keeping account of the material. Usually, if the quantity used on a standard shop order is small and variable it is considered as overhead expense in each department. Even in this light it is a variable with production and should be given some attention. If a considerable quantity is used and yet not enough to warrant individual consideration on the material requisition it may be charged as a variable percentage of materials on the Compilation of Standard Costs--varying with the type or size of the product. This necessitates a credit to that material account in

the regular monthly journal entries picked up from the Compilations of Standard Costs. When physical inventories are taken the variation of the amounts charged to the product from the actual amount used would have to be taken up as burden. Too great a variation would require analysis.

SUPPLIES CHARGED INTO BURDEN

In some cases it may be well to charge all of the supplies materials into burden. If the control over the quantities used is a matter of foremens supervision when large quantities must be kept on hand near the individual worker, it is nearly impossible to set standards. To be sure, the quantity that should be used can usually be measured, but in modern factories workmen are so pressed for time that some waste is likely to ensue. There is no exact dividing line between that kind of materials which must be considered as material and not overhead but the aim is to charge into prime costs that which can be distinctly governed by set standards and to consider all other supplies as overhead.

CHAPTER VII

LABOR: THE BEDAUX SYSTEM

METHODS OF ACCOUNTING FOR LABOR COSTS

The first method of recording the costs of labor in a cost accounting system was that of assigning in total to an account called "Direct Labor" all of the wages of all the employees working directly on the product and of all the wages of all those not working directly on the product to an account called "Indirect Labor". If the system was a job cost system attempting to obtain actual costs as the product went thru the various operations a careful record was kept of each direct workers wages, and separate accounts for each kind of operation, or possibly, for each particular job done. If it happened to be a process cost system by necessity, or for convenience, it mattered little whether the labor was direct or indirect, because the only reliable figure was the total cost to manufacture.

Our problem is not to go back over the work done or not done by other cost systems, but rather to build up with the help of present day standards and methods, a system of controlling, rather than merely recording the costs of manufacturing. It is also of relatively little importance whether the business is adaptable to a system of job costs or process costs. Because job costs involve greater problems we are writing with job costs directly in mind altho in fact nearly every thing the process cost system needs or can use is to be found in this exposition of job costs.

From the day work system of recording labor, cost accounting passed on to the piece work system whereby each worker was given an incentive to do more because he was paid for all he did. This

system had considerable success until it became apparent to the manufacturers that labor could always have done more work. Whereupon, the management promptly cut the piece work rates to the point where the worker had to work quite hard to obtain a minimum living wage. This destroyed the whole idea in back of the system, since incentive in the form of extra wages was needed to produce extra effort.

Piece rates are ~~simply~~ a monetary value placed on each good piece of work done. The more work done, the greater the wage. It is a rate expressed in terms of dollars and cents, and based on what a normal man should be able to do according to ~~some~~ an engineer who clocks his actual working time in the performance of an operation. There is little or no allowance for fatigue and if the work is not brought to the employee at the proper time he must wait and lose time and money after he has completed the work before him.

ANALYSIS OF THE PROBLEM

The Bedaux engineers gave considerable time to the study of the factors which make up the labor problems of today and came to the following conclusions:

A. The only two stable factors are the time element and the individual man.

B. The unstable factors are; (a) wage rates which fluctuate with the experience of the man, with the periods of depression and growth, as well as with the status of the particular business regardless of other factors; (b) overhead which is ordinarily distributed in proportion to direct labor paid and with fluctuating wage rates must necessarily be distributed incorrectly under that method

of distribution; (c) the amount of work to be done and which is to be distributed to the workmen within a given department; (d) the manner of distributing this work, i. e., the planning of the work, the unwise planning of which brings about idle time for which the individual worker is not responsible.

C. The method of time study heretofore used was found to be erroneous because it did not take into consideration fatigue. A considerable amount of time and energy was expended in discovering certain basic principles involved in the doing of many different kinds of work. The following facts were brought to light: (Taken directly from a report on the Bedaux System)

"1. For a ~~given~~ muscular effort of a given power, the duration of work and rest periods are inversely proportional to the rapidity of the action.

2. For a muscular effort of a given power, the percentage of rest is directly proportional to the rapidity of the motion and completion of the cycle".

This means that with lighter work requiring rapid action and completing the cycle of work very often the percentage of rest necessary is very high. With work that requires less rapid motion and completes the action of its cycle less frequently the percentage of rest is lower. There is a whole range of varieties of work between the two extremes, with a range of necessary rest periods from 10% to 150%. Tables have been compiled of ~~all~~ the ratios of rest and unavoidable delays affecting the various forms of human physical effort in industry. It was further found that in longer operations there is greater opportunity to combine movements and obtain greater efficiency.

With the foregoing conclusions in mind a method of remuneration was searched for, ~~and found~~, which gives the employee an incentive to work and rewards him in proportion to the amount of work done, ~~and~~ yet does not penalize him for idle time except to take from him some opportunity to earn more bonus. That is, he is paid at a base rate for all the time he is not working, due to lack of work or poor planning.

CHAPTER VIII

METHOD OF REMUNERATION AND ANALYSIS UNDER THE BEDAUX SYSTEM

THE TIME ELEMENT

The first consideration is that of the first constant element, namely, time. It is certainly possible to assign to any one operation a time limit that is fair if the actual working time and the amount of rest required to perform the cycle of the operation are given due consideration. It is not an easy task and must be done by an expert in that line but it can be done and that is the starting point for the accounting for labor.

MAN POWER

The next element is the man--also a constant. The apprentice cannot be gauged exactly as to the amount of work or the kind of work he can do capably but the trained worker can do his particular operation within ~~the~~ time limits. His pay must be based on his experience, the rapidity with which he can complete the operation and the labor market. In any event, while working on any particular operation his working value can be determined at the time under consideration. ~~To be sure~~ The value of his work may increase as he shows himself to be equipped to perform other operations or the labor market may go up or down thus necessitating changes in the primal values. But at a particular moment his time while working on a particular operation has a value which we shall call his base rate. It is not an hourly rate but a rate for each 60 Bedaux points completed.

THE BEDAUX POINT

A Bedaux point represents the unit of measurement of the

effort put forth to perform a certain operation requiring one minute of one man's time under normal existing conditions and contains an allowance for necessary rest from fatigue.

THE LABOR OR SHOP ORDER TICKET

In the chapter on material we explained how the order to manufacture (called the cycle sheet) emits from the planning department and arrives at the plant office. The cycle sheet (Form #6) shows three definite factors to the person in charge of the plant office (or as it may be called -- the ticket department) these are the shop order number, the kind of goods to be manufactured and the quantity to be made. From this information the labor or shop order ticket (Form #7) is made out. The shop order ticket is a printed form and there is one for each form and code number because the bedaux rates always vary even tho the only difference between two commodities being manufactured are size, i. e., the same operations are performed on them. The back of the labor ticket is coated with glue. The top of the ticket shows the necessary information about the kind of work called for, that is, regular work or work of some special nature. It also tells in detail what the form and code number expresses in symbols--size, kind of article, color and whatever other information may be used to identify it. There is also space for inspection certification and for final operations which may not come under the bedaux labor. The list on the extreme left of the labor ticket is the order of operations (in reverse order) necessary to produce the desired finished product from the ~~given~~ raw material. A second list of operations is on the right of the first and there, in order, we find, shop order number, quantity, form and code number and rate. The rate is expressed in minutes or bedaux points allowed for each operation for a standard quantity. The order number, quantity, and code number is inserted in

repetition beside each operation by the printing, or ticket department(a part of the office which is included under office manufacturing expense) where the blank tickets are kept.

THE COUPON SHEET

When the worker completes an operation he cuts off the part of the labor ticket applicable to the task he has finished leaving only the operation symbol on the extreme left. He sticks this coupon onto a labor coupon sheet (Form #11) of which he is given one each day. In the upper right hand corner of the coupon sheet there is a space for the recording of time in and out by the worker. The sheet is inserted in the time clock upon coming in and going out, which stamps the time thereon and so the exact number of hours at work is recorded. When the days work has been done there is a record of the number of jobs completed, the exact work done and the rates which are allowed on the jobs. It is a simple matter then to figure the number of B's (Bedaux points) earned which is inserted in the space Total B's on the right hand side of the coupon sheet. Total minutes and total hours are computed from the time clock recordings at the top of the page.

When the worker is not engaged in direct or productive labor, for which there has been established bedaux rates, the time must be recorded in the space designated for Allowed Time and Unmeasured Work. The time of starting and finishing as well as the cause must be given in each case. The coupon sheet must then be approved by the foreman in charge. Indirect minutes includes all non-productive work of whatever nature. Unmeasured minutes are recorded for productive work done on special jobs, for which no bedaux rates have been set, and for apprentices when they are first put on bedaux rates and cannot be expected to complete the work in the time set

by the standards department. Allowed time is recorded for minutes away from the job for special necessary reasons, such as going to the plant hospital etc.; it is also allowed when work is not ready for the worker after he has completed a previous assignment. In all cases of allowed time for which the department is not responsible, that is, due to events over which the department head has no control, a complete record of the time and cause must be shown on the coupon sheet and it must be so labeled--"Department Not Responsible."

Total (3) is the addition of the indirect minutes, unmeasured minutes and allowed time minutes. Premium B's are arrived at by deducting from total B's the total minutes earned by the worker during that particular day. ~~from which~~ From the Premium B's, the premium, or bonus, due the worker, will be calculated. The worker receives as his share seventy-five percent of the extra minutes earned at his regular base rate per hour. The hours on B value are calculated by deducting total (3) from the number of hours worked. The B hour for the day is calculated by dividing the total B's by the hours on B value.

THE POSTING SHEET

The coupon sheets are posted to the Posting Sheet (Form #13) and at the end of the week the total earnings are calculated thereon and transferred to the regular payroll books to be summarized for payroll journal entries. Each worker is guaranteed earnings at his base rate unless he is notified to the contrary--a possibility when his B hour is continually below the standard of sixty B's per hour. The posting sheet allows the summarization by departments of the number of hours worked on bedaux, the B's earned, the average B hour, the premiums earned, the allowed time (which includes indirect minutes of bedaux workers as well as other allowed time) the minutes on unmeasured work and the allowed time department not responsible.

THE WEEKLY BEDAUX ANALYSIS SHEET

The Weekly Bedaux Analysis Sheet (Form #13) provides for the setting up in total of all the information on the posting sheet under the headings Direct Labor on Bedaux and Analysis of Payroll. The column "Penalty B's" comes from a record of spoiled work which is charged back against the department. Such spoiled work is a rare occurence and only under peculiar circumstances, wherein it seems to be ~~due to~~ caused by undue negligence, or when such spoiled work affects other departments, is spoiled work charged against a department in this manner. The "Indirect Labor" amount includes supervision and other indirect labor from the general payroll books as well as from allowed time and indirect minutes of productive workers. The Analysis of Indirect Labor Hours breaks down all indirect labor (actual) and distributes it under such headings as: Supervision, Machinist, Supply, Cleaning, Trucking, etc. The allowed time indirect labor is broken down in a similar manner, based on time study of the total which should be expended ~~in~~ by the department.

FORMULAE FOR THE ANALYSIS SHEET

The following are the formulae for the computations on the weekly analysis not mentioned above. The final endeavor is to set up the departmental and supervision effectivness and the total losses. However, all of the information elicited is of value in bedaux analysis.

$$\text{Direct B Hour} = \frac{\text{Net total B's}}{\text{Total hours}}$$

Total Hours Indirect Labor is actual.

Total Indirect B's = Factor times Direct B's

Factor = Proportion of Indirect minutes allowed to productive B's based on Time Study.

$$\text{Indirect B Hour} = \frac{\text{Total Indirect B's}}{\text{Total Indirect Hours}}$$

$$\text{Total B Hour} = \frac{\text{Net Total B's plus Total Indirect B's}}{\text{Total Direct Hours plus Total Indirect Hours}}$$

$$\text{Direct Cost per 1000 B's} = \frac{\text{Total Direct Labor on Bedaux}}{\text{Net Total B's (by 1000)}}$$

$$\text{Indirect Cost per 1000 B's} = \frac{\text{Cost of Indirect Labor}}{\text{Net Total B's plus Minutes of Unmeasured work (by 1000)}}$$

Total Cost per 1000 B's = Direct Cost per 1000 B's plus Indirect Cost per 1000 B's

$$\text{Cost per Standard Dollar} = \frac{\text{Total Cost per 1000 B's}}{\text{Standard Cost per 1000 B's (total)}}$$

(assumed to be points which should be obtained 60 per hour by both indirect and direct workers)

$$\text{Departmental Effectiveness} = \frac{\text{Total B Hours}}{\text{Cost per Standard Dollar}}$$

Total Losses = Cost per 1000 B's of work minus Standard cost per 1000 B's times 1000's of Total B's.

$$\text{Cost per Standard Dollar corrected for cost of Department not responsible hours} = \frac{\text{Cost per Standard Dollar times (Total Cost minus Cost of lost hours)}}{\text{Total Cost}}$$

Total Cost = Total Labor cost on Bedaux plus Indirect Labor Cost.

$$\text{Supervisional Effectiveness} = \frac{\text{Adjusted Total B Hours}}{\text{Adjusted Cost per Standard Dollar}}$$

$$\text{\% of unmeasured work} = \frac{\text{Minutes of unmeasured work}}{\text{Net total B's plus Minutes of unmeasured work}}$$

Cost of process allowance = Cost of any labor paid by the hour who is unable to get in a full hour of actual work.

See appendix for problem worked out with a hypothetical department.

CHAPTER IX

LABOR STANDARDS UNDER THE BEDAUX SYSTEM

It can be seen from the information given above that all labor is at standard regardless of how much over or under the standard of 60 B's per minute the workers actually work. Therefore, on each shop order which goes thru to finished product the labor may be set up at standard according to the compilation of standard costs. The next problem is how to set up direct labor costs on our cost records to account for, or equal, the amount charged into the finished product.

BASE EARNINGS AND PREMIUMS CALCULATIONS

The base earnings for each operator on the posting sheet (Form #12) are calculated by dividing the total B's earned for the week by 60 and multiplying by the base rate. The result is the total standard cost of direct labor by the operator since the Bedaux rates or B's are the standard time allowance, and standard labor cost on the Compilation of Standard Costs is calculated by multiplying B's allowed by the base rate. The daily premiums earned as calculated on the coupon sheets and carried forward to the posting sheet represent three-fourths of the Direct Labor-Premium cost. If the total for the week for each operator is divided by three and multiplied by four the result if the total Direct Labor-Premium cost. The total Direct Labor-Premium cost is deducted from the total standard cost of direct labor (above) and the result is the Direct Labor earnings of the operator for the week which appears in the base earnings column. The remaining amount of the total base earnings (calculated by multiplying base rate by hours worked) appears as the Indirect Labor earnings. Thus two amounts appear as base earnings for each operator.

Base earnings are charged to two accounts "Direct Labor" and "Indirect Labor" in the cost records. Premiums are charged to an account called "Direct Labor-Premiums". It is important that the premiums paid are kept as a separate record. The corrected or standard costs for unmeasured work must be calculated and charged to Direct Labor and credited to Indirect Labor since it was all charged to indirect earnings at the base rates of various workers on the posting sheet.

In effect what is done is to charge at standard all the direct labor cost to an account called Direct Labor except that the account called Direct Labor Premiums contains only three-fourths of the standard direct labor cost on the productive work done by workers who earn a premium. The reason is this: Indirect workers and supervision can help the productive worker a good deal by doing their work well or better than average; therefore they are entitled to a portion of the premium earned by direct workers; they are only paid this premium, however, if the departmental and supervisional effectiveness is above 100% and they are paid this bonus on the basis of the B's of effectiveness earned in the department.

DEPARTMENTAL AND SUPERVISIONAL EFFECTIVENESS CALCULATIONS

Let us look into the method of calculation of the departmental and supervisional effectiveness analytically. The determination of the Direct B hour (Weekly Bedaux Analysis Sheet) is based on the proportion of total direct B's earned to the total minutes worked. Therein lies a penalty--a detriment to high departmental effectiveness--because every minute lost thru allowed time or indirect minutes lowers the departmental effectiveness thru the Direct B hour. In the calculation of the Indirect B hour a similar effect is seen for if in comparison to the total direct B's earned many indirect hours are required, the Indirect B hour will be proportion-

ately smaller. The two together make the Total B hour. The calculation of direct and indirect costs per 1000 B's reflects not only the cost of direct and indirect labor alone, but the charges to indirect labor for the allowed time and indirect minutes of direct workers, which is often idle time, are included as well, which appreciably affects a comparison with the Standard Cost per 1000 B's.

STANDARD COSTS PER 1000 B's

Standard departmental costs per 1000 B's are set up on the basis of 60 B's per hour earned by both direct and indirect workers. The standard cost of indirect labor will be based on the indirect labor factor (calculated by time study) times the net total direct B's which would in turn be total direct hours times 60 bedaux points or perfection. The cost per standard dollar is a ratio of actual total cost per 1000 B's to standard cost per 1000 B's and reflects the percentage over or under standards maintained by the department. Obviously the goal is 100%, or an exact one dollar actual cost in comparison with standard--or better. Departmental effectiveness is the ratio of total B hours to the cost per standard dollar and it expresses in B's of effectiveness a comparison of total work done to the cost of the work in relation to the standard cost of a perfect department. Supervisional effectiveness is the same thing corrected for the lost time for which the department is not responsible, i. e., for all allowed or idle time the causes of which that department has no control over. Such causes might be poor planning, a broken down machine in another department, etc.

PREMIUMS TO INDIRECT WORKERS

A bonus or premium, is paid to all indirect workers monthly based on the average of the weekly supervisional effectiveness. If the supervisional effectiveness averages 63 points for the month they are paid a premium of 3 points for each hour worked, or one-twentieth of the average base pay of direct operators in the department. This is an incentive and gives them an interest in points earned by the productive workers. This premium is charged to Direct Labor--Premiums and is their portion of the premium earned by direct workers. Before this monthly charge is made to the account, the total premiums earned are calculated by adding one-third to the total charges of the Direct Labor--Premiums account. Previously there has only been charged to the account seventy-five per cent of the standard labor charges on the Coupon Sheet (Form #11). The total charges to this direct labor account plus the charges thru base earnings on the Posting Sheet (Form #12) to the regular Direct Labor account must equal the standard direct labor charges on all completed shop orders. Having arrived at the total premiums which must be charged to that account and knowing the amount to be charged for premiums paid to indirect workers it will be seen that in order to have the correct debit balance in the account we must either make an additional charge or credit to the account (usually the former). The offsetting credit or debit to this entry will be indirect labor because standard labor charges have been set for each type of work. To be sure, the standards have been set in minutes allowed to do the work, but they are definite standards and based on a calculation of the operators efficiency. The standards have been set in order to have a basis of comparison. For analytical purposes we can go to the Posting

Sheet to determine which operators are not earning the standard or 60 B's per hour, and to the Weekly Bedaux Summary for departmental and supervisional effectiveness. The final effect is that direct labor is charged into the cost of the product at standard and standard cost of direct labor is always maintained.

ANALYSIS OF INDIRECT LABOR

Indirect labor must be analyzed and compared with a standard. This is done on the Weekly Bedaux Analysis Sheet. The allowed indirect labor is set up by time study and a direct comparison is made. It may be broken down into its component parts in this manner. Especially should the indirect labor of productive workers be analyzed for idle time, broken down machines, cleaning machines etc. should the amounts charged to indirect labor become excessive.

In the appendix to this study a problem, or example, showing the use of the forms described herein has been worked out, with comments on the various procedures and on the conclusions reached.

CHAPTER X

BURDEN STANDARDS

The accurate distribution of manufacturing overhead or burden to the product is one of the most important things any cost system attempts to accomplish. All manufacturing expense which cannot be considered as either material or productive labor is overhead expense. The first cost systems made no attempt to attach a part of the overhead to the cost of a particular product. It wasn't considered feasible and, indeed, the necessity for doing so to determine accurate costs was not recognized. The method of distributing overhead (if it was distributed at all) was to lump it all together and distribute it to the product, or products, on the basis of material costs, labor costs, or direct labor hours. This required considerable estimating at the beginning of a year, or period, as to the quantity which would be manufactured and the total expense involved in overhead. In many manufacturing plants the results were undeniably good either because the variety of products manufactured was not large, or the phases of manufacture the different products went thru were not very dissimilar and did not at the same time require a great variety of expense either in machinery, direct labor requirements, or general overhead expense. But if, for example, one product required the use of a machine of several times the value of that required by another product, occupying several times as much space, and requiring more tools, and yet if the direct labor hours and direct labor cost of each product was the same, how absurd it would be to charge the overhead on the basis of either direct labor hours or direct labor cost.

THE MACHINE HOUR RATE

Cost accountants began to look for a method of distributing overhead on a more accurate basis and evolved the method known as the machine hour rate. Briefly, the method is this: The manufacturing plant is divided into departments which usually represent the processes of manufacture; each department is divided into machine areas, i. e., the area taken up by each machine and necessary for its efficient operation . To each machine is charged all the direct overhead involved in its operation which includes depreciation on the machine, cost of set-up labor, repairs, power, tools and an amount called rent which is based on floor space occupied and is a proportion of the building depreciation, taxes, insurance, and up keep. To the direct machine charges is added a proportion of the departmental expense, such as supervision labor, supplies not directly chargeable to a machine, etc. Thus each machine bears an integral part of the overhead expense. This expense is set up for a year, or an accounting period. It is necessary then to determine how many hours the machine is expected to be operated in that period. This determined, a rate per machine is set and the product is charged with a proportion of the expense based on machine hours necessary to process it in that department, and so for each machine used in manufacturing the product a proportionate part of the burden is added to the cost of the product. It sounds good, and it is good, in so far as approaching actual burden costs is concerned.

DISADVANTAGES OF THE MACHINE HOUR RATE

The difficulty lies in the expense involved in operating the machine hour rate method of distributing burden. Quite an extensive

array of cost records is necessary in order to correctly maintain the system. It is generally agreed among cost accountants now, that the expense is disproportionate to the value of the system, except in some rare instances. If the departments, processes, or number of machinings required to finish the product are relatively few in number, and if the time requirement for each process is relatively long, and the products few in number, the expense of allocating burden by the machine hour rate method would not be much more expensive than any other desirable method--indeed if the variation between burden costs calculated by the machine hour rate and the overall rate or the departmental rate was very large due to differences in machine costs, power or set-up labor costs for the same process on different products, the machine hour rate would be the only advisable method.

DEPARTMENTAL BURDEN RATES

The departmental rate method of distributing burden is a method adaptable to most manufacturing plants and yet it is effective if correctly handled. In the main two things must be done correctly in order to have burden rates which approach actual, and which may be used as standard: (1) Within a department the machines must have the same relative cost, use a relatively like amount of power, have the same relative cost of set-up labor, and cost relatively the same amount for repairs and tools (the word, relatively, is used in the sense that while one machine might have a higher machine rate per hour than another, it would require proportionately less time for the operation and so the same or similar results are obtained at the same burden cost per article processed). (2) Burden must be distributed by departments based on labor hours. This follows logically in the light of principle

(1) (above) since within the department each machine has the same or nearly the same relative burden cost per machine hour. It is the time element which affects the burden cost in this instance. That the actual hours of productive labor will not always equal the standard hours of productive labor in the true sense of the word, even tho labor is always charged to the cost of the product at standard and labor reimbursed on that basis, must be recognized and dealt with. It is discussed in this thesis under the heading "Burden Variations".

The entire procedure of setting up departmental burden rates is shown under the next ~~heading~~ chapter called "Forms and Usage for Departmental Burden Rates".

OVERALL BURDEN RATES

Many manufacturing plants have used, and are still using the overall burden rate with good results. Perhaps not many of these manufacturing plants have true standard cost systems. By that, it is meant, that they do not endeavor to forecast what their manufacturing costs should be. At least a few standard cost systems provide an overall rate. Undoubtedly, it is less expensive, but unless the overall rate as such is analyzed or unless it is set up analytically with considerable thought given to what the standard burden expense should be for all the variable items, it is much like working in the dark. In practice most cost systems utilizing the overall burden rate set it up on the basis of past experience tinctured with a knowledge of the changes which are manifest. Their reasoning for that basis is likely to be that a profit was realized in the past, and, given equal production and, ~~of course~~, sales, a profit should still be made.

There are two excellent reasons why overall burden should be set up on a basis that is analytical and made up of component parts, each of which has been given due consideration in the light of standard costs. First, sales may vary as a whole or in part. Where more than one product is manufactured, a single product may vary sufficiently to throw the overall burden rate off, while the total sales may not vary in total amount for the period under consideration due to an increase or decrease in the sales of a product, or products, the actual burden of which is different from that of the first varying product. This alone can cause great differences in the total of burden charged to finished goods. From this point of view it can be seen that a complete analysis of estimated sales for the benefit of production is essential. Secondly, knowing the production that is expected for each product a direct money-saving analysis of overhead expense can be made in each department. Unless this is done, and real standards set up by departments, the overall burden rate is lacking in significance.

The question might ~~well~~ be asked, "How can it be known wherein the variations lay between actual and standard?" Simply by breaking down the actual burden costs into component parts and comparing these with the standards which were set up. Of course, the differences and the reasons therefore would not be known until long after the damage was done, and too late to repair it, except to guard against it in the future. A system of overall burden rates calls for the shortest feasible period of time over which the burden standards can be set--preferably not more than six months.

CHAPTER XI

FORMS AND USAGE FOR DEPARTMENTAL BURDEN RATES

COMPILATION OF PRODUCTIVE LABOR HOURS BY MACHINES

The primary requirement of departmental burden rates (or for that matter any burden rate used in standard costs) is a complete analysis of sales. As we have seen in the chapter called "The Sales Budget". sales are estimated by products and by months ~~and allocated to the salesmen as a quota or standard to be expected.~~ This covers a period of six months or a year, usually the latter. From this information the productive labor hours by machines is compiled according to the Compilation of Standard Costs and the labor standards as set by the Bedaux System and on file in the cost department. This information should be listed by products, by departments, by machines and by months under sub-headings. It is called the schedule of standard machine hours.

BURDEN DISTRIBUTION

Burden will be distributed to the product on the basis of standard direct labor hours in each department. It will be carried as a separate item on the Compilation of Standard Costs as it moves thru each department. At least, that is the effect of it. Actually, when the goods are finished they are charged with burden at standard as well as material and labor at standard. For inventory purposes a physical inventory must be taken and comparison by shop order numbers made with the list of shop orders, or cycle sheet (Form #6) not checked off the copy held in the cost department as finished goods. If closer contact with shop orders seems necessary, that can be done by the submission of a report of shop orders finished in each department daily. These can be checked off an appropriate

space made for each department opposite the shop order number on the list of shop orders put into process.

DEPARTMENTAL BURDEN RATES

The calculation of departmental burden expense is described below. It is accomplished by carrying the burden expense thru the service departments, such as power and machine shop, thru the departmental machine rate which includes all variables calculated as direct machine expense, and finally including a proportion of the general factory and the regular departmental expense. The burden rate in each department is calculated as a unit based on the estimated machine hours in each month taken from the schedule of standard machine hours. Since the schedule of standard machine hours is based on production for a year, or the period of the sales budget, it will be necessary to set the departmental standard of machine hours for a month by interpolation.

MACHINE DATA

Machine Data cards (Form #14)* give the statistical information for the Departmental Machine Analysis (Form #15). One of these forms is composed for each department. As stated in the previous chapter each department, for burden purposes must be made up only of machines having the same, or nearly the same, relative burden rate per machine. The elements of burden applicable directly to the machines which may vary and which are calculated in the Departmental Machine Analysis are (1) Interest charged to cost (2) Machine Depreciation (3) Power (4) Set-up Labor (5) Repairs and (6) Tools. The first two vary only between machines. There is one other factor which varies between machines which will only be considered for the department as a whole--that is rent, including light, heat, etc. The other four variables are contributing causes to internal upsets

*See next page.

*The Machine Data cards may also serve as machine record cards for depreciation purposes--as subsidiary records to the asset accounts for machinery.

in burden calculations and require ~~real~~ careful consideration. Power and set-up labor are based on standard machine hours (see above). Repairs and Tools are estimated for each machine based on the kind of machine, its present conditions and past records. The burden costs which have been derived in this manner are to be used as standard. Later it will be seen how the actual is analyzed if it varies from the standard to the extent that the burden accounts are in a precarious condition.

STANDARD EXPENSE SCHEDULES

The Standard Expense Schedule for Power (Form #16) shows the set-up of power expense and the calculations necessary to arrive at the cost per kilowatt hour. The total of standard units or kilowatt hours is determined from the Departmental Machine Analyses. Due allowance should be made for the efficiency of the power system. If the power system also generates light and heat the calculation must include these items based upon floor space (floor space is determined by building analysis under indirect departmental expense --see below) and a reasonable proportion of the expense of the power system must be set apart for light and heat. The elements of power expense are (1) Coal and water (2) Labor: Engineer, foreman, electrician (3) Supplies: Lubricants and miscellaneous (4) Maintenance materials (5) Fixed Charges: Depreciation, insurance, taxes, interest on the investment. Power expense is set up on a monthly basis as are all overhead items entering into the standard

burden costs.

The Standard Expense Schedule for Floor Space uses the same form as Power (Form #16). The elements are (1) Payroll: Millwright, Carpenter, Plumber, Laborers, Watchmen (2) Maintenance Materials (3) Fixed Charges: Depreciation on Buildings and Furniture and Fixtures; Interest charged to cost on Buildings and Furniture and Fixtures, Insurance and Taxes. The floor space is calculated for each department, and that which cannot be assigned to a particular department is charged into General Factory Expense. The Summary of Machine and Bench Hours, Power Consumption and Floor Space (Form #17) is a convenient method of showing the distribution of these three factors. The totals are used as the standard units for the Departmental Machine Analysis, Power, and Floor Space Expense Schedules.

The form used for Power Expense (Form #16) is also used as a standard expense schedule for Departmental Expense and General Factory Expense. The elements of General Factory Expense are (1) Salaries and payroll, Superintendent, Stenographer to Superintendent, Store keeper, Stores Clerk, etc. (2) Plant Office (3) Office Manufacturing (4) Supplies (5) Floor Space. That there should be a plant office separate from the main office is almost inevitable, and this office is charged with its own expense including its proportion of floor space. Office Manufacturing includes the following departments in the main office: Cost, Payroll, Purchasing, Planning, Production and Sales Analysis (for costing purposes). The elements of Departmental Expense are (1) Departmental Machine Analysis (2) Indirect Labor: Foremen, inspectors, shop clerks, truckers and sweepers (3) Supplies (4) Floor Space (5) General Factory Expense.

TYING IN THE SYSTEM

The following entries show the accounting principles involved in setting up standard burden costs on the books. They also show how the burden expense ties in with the general ledgers. They are not given in extreme detail. The broad principles only are illustrated. All accounts are cost ledger accounts unless designated for the general ledgers.

FROM THE DEPARTMENT MACHINE ANALYSES:

Debit: Departmental Burden Accounts

Credit: Interest charged to Cost (General Ledger)
Machine Depreciation Accounts (General Ledger)
Standard Power Expense
Standard Machine Shop Expense
Standard Set-Up Labor Expense (by departments)
Standard Repairs Expense (by departments)
Standard Tools Expense (by departments)

To set up the standard machine expenses by departments.

FROM THE STANDARD POWER EXPENSE SCHEDULE:

Debit: Standard Power Expense

Credit: Power Expense (General Ledger)
Standard Floor Space Expense

To set up the actual power expense (a similar entry is made for Standard Machine Shop Expense).

FROM THE DEPARTMENTAL EXPENSE SCHEDULES:

Debit: Departmental Burden Accounts

Credit: Standard Department Expense
Standard Floor Space Expense
Standard General Factory Expense

To set up the standard department burden expense.

FROM THE GENERAL FACTORY EXPENSE SCHEDULE:

Debit: Standard General Factory Expense

Credit: General Factory Expense (General Ledger)

Plant Office Expense (General Ledger)

Office Manufacturing Expense (General Ledger)

Standard Floor Space Expense

To set up the actual general factory expense.

FROM THE FLOOR SPACE EXPENSE SCHEDULE:

Debit: Standard Floor Space Expense

Credit: Payroll accrued (General Ledger)

Fixed Charges (General Ledger)
(Includes depreciation, insurance, taxes and interest charged to cost).

Maintenance Material Expense (General Ledger)

To set up the actual floor space expense.

The following entry brings on the actual expense in the general ledgers (all accounts are general ledger accounts unless otherwise indentified).

Debit: Power Expense

Standard Set-Up Labor Expense (Cost Ledger)

Standard Repairs Expense (Cost Ledger)

Standard Tools Expense (Cost Ledger)

Machine Shop Expense

General Factory Expense

Plant Office Expense

Office Expense Manufacturing

Maintenance Materials Expense

Credit: Accounts Payable

Accrued Payrolls

To acknowledge the actual monthly expense.

It can be seen from an examination of the above entries that in all cost ledger burden accounts the credits represent the standard and the debits the actual expense. This allows easy and frequent sight analysis with no ~~extra~~ effort. That is, if there is a very great difference between the total debits and the total credits in any one month or period in any account it will show up very plainly and thus call attention to the fact that further analysis should be in order.

UNITS OF CALCULATION

The final unit of calculation of departmental expense is expressed as a dollar value per machine hour. But the machine hours were calculated from the estimated production and based on the standard labor minutes as calculated by the Bedaux System and shown in the Compilation of Standard Costs. Therefore, if production is carried on according to the estimate, burden can safely be distributed according to the standard labor minutes regardless of whether the standard is reached or bettered by direct labor. This is true, because as we have seen in the chapters on labor, B's earned as shown on the Posting Sheet (Form #12) represents standard labor, regardless of the actual time taken to do the work. Accordingly, the standard labor time may be used as the basis for distributing overhead or burden. It will be seen later how the B's earned will be used to analyze burden variations.

THE TRUE VALUE OF THE SYSTEM

It is a certainty that burden will either be under or over earned according to the book records. That is true of any system. With this system, however, it is felt that if due care is exercised in setting up the burden standards and if variations from the standard are carefully watched and steps taken to keep the

variables down to standard and, further, given an estimated production which, in fact, is very nearly realized, that the burden variation will be kept at a minimum.

CHAPTER XII

BURDEN VARIATIONS

Every standard cost system provides for the analysis of variations from standard. Some of them have very complicated forms for analysis which require formulae for the correct interpretation thereof. This thesis has shown how materials variations can be analyzed and ~~now~~ proposes a simplified form for burden analysis. Labor, of course, needs no analysis other than the weekly bedaux form which gives the indications of effectiveness since direct labor is always paid at standard.

FINDING THE BURDEN VARIATION

The estimated burden charges for the year should be charged into the burden accounts thru monthly journal entries and redistributed to the departmental burden accounts at the same time. This assumes monthly postings to all ledgers from the books of original entry. The standard charges for burden are also journalized each month from the records of finished goods. This information is compiled in accordance with the standard burden charges on the Compilation of Standard Costs on file in the cost department for each form and code number. To analyze the burden variation in a given department reduce the total B's earned weekly (from the Departmental Posting Sheet (Form #12) to hours by dividing by sixty. The burden charges for that department will be the total B's reduced to hours times the unit burden rate (from the Standard Expense Schedule--Departmental, Form #16). This figure is then compared with the Standard Monthly Journal entry for burden in the particular department. If the variation is disparaging then it is due to the fact that either more or less

work passed thru the department than was estimated. The next step is an examination of the schedule called Standard Machine Hours which shows the estimated productive machine hours in each department based on the sales budget (described above). If the business is a seasonal one and production is likely to vary in different months, this should have been indicated, and the standard departmental and machine hours should vary by months to take this into account.

BURDEN VARIATION ANALSIS

The burden variations analyses need only compare the labor standard hours (as indicated by B's earned) with the machine hours standard. The Analysis of Burden Variations (Form #18) is a composite form for comparison of burden charged to finished product with the standard departmental burden charges. It is a monthly analysis and is expressed in money value altho the unit for the charging of burden is the same as that used to set up the standard and it might well be set up as a comparison of standard machine hours estimated with the standard labor hours charged.

DISPOSAL OF BURDEN VARIATIONS

Burden variances are due to two causes: (1) Incorrect distribution rates or incorrectly estimated overhead and (2) Production that is less than or more than normal or the estimate. It is more than a possibility that there will be some variance between the estimated and the actual overhead. If the variation is not large it should not cause much concern and should be carried as a separate item on the manufacturing statement as cost of goods manufactured or as a deduction from the cost of goods manufactured. If it is large and is under absorbed burden it should be redistributed to the manufacturing accounts and to the work-in-process inventories.

If the burden is large and over absorbed it should be carried to profit and loss direct after adjusting inventory accounts.

Burden variances due to idle time or production less than normal or estimated (and therefore under absorbed) should be carried as a profit and loss item and should not affect either inventory or manufacturing accounts. It may be advisable to amortize such burden variances over a period of better years altho that is not a common practice in this country. Over absorbed burden due to excessive production is carried direct to profit and loss after adjusting inventories for their proportionate amounts.

CHAPTER XIII

SHOP ORDER CHARGING IN THE COST DEPARTMENT

THE MANIFOLD USES OF THE SHOP ORDER TICKET

As the product is finished it is received by the stock room clerk and the remaining part of the shop order or labor ticket (Form #7) is sent to the Cost Department. The labor coupons have been clipped off as the work was done and the quantity of firsts and seconds finished, which must total the quantity for which the labor ticket was issued, have been inserted on the card. In the Cost Department the information on the labor ticket is recorded on summary sheets for the purpose of charging the good pieces finished into the proper finished product classification, and to credit the proper materials accounts as well as the direct labor and burden accounts. At this time the seconds are charged into salvage, seconds or spoiled work accounts. Seconds are charged with their proportion of standard material, labor and burden exactly as the good pieces finished are. Seconds are also charged with recovery labor which comes through on special labor tickets issued on shop orders for that purpose, but are not charged with any further burden costs. Recovery labor may be and probably would be standardized with standard bedaux points being set therefor if a considerable amount of such labor should be necessary.

THE SUMMARY SHEET FOR PRODUCTION CHARGING

The summary sheets used by the Cost Department are not exemplified here because they must vary so considerably under different conditions. It is plain ~~though~~ that they must give the following information which is compiled from the labor tickets and the material requisitions together with the compilation of

standard costs:

(1) Finished goods charging

(2) Seconds charging

(3) Materials credits

(4) Labor and burden credits

(5) Loss or gain on materials--debit or credit (complied from the yellow and pink requisitions (Form #9) held in the Cost Department "In process" files).

The net results tabulated on these summary sheets of shop orders finished are the figures for the monthly journal entries previously mentioned in the chapter on Materials.

SALVAGE ACCOUNTS

The seconds or salvage accounts are credited for the standard material, labor and burden on all pieces recovered and placed in finished stock. The accounts are also credited with the proceeds of the sale of waste or scrap. The balances of these accounts after being credited with the value of any spoiled work in process of recovery, and the market value of waste on hand, represent the loss or gain on spoiled work at the end of the period.

CHAPTER XIV

FORECASTED PROFIT AND LOSS STATEMENTS

BUDGETING SELLING AND ADMINISTRATIVE COSTS

The foregoing chapters have described a standard cost system of accounting for manufacturing costs. Within limits it is possible to budget selling and administrative costs. The scope of this thesis does not, however, provide for an exposition on the possibilities implicated therein. It must be considered that administrative and selling costs have been budgeted and standards determined either as a percentage of sales or by reference to prior periods or in some other manner.

FORECASTED PROFIT AND LOSS STATEMENTS

Given a knowledge of the cost to manufacture, selling costs and administrative costs it is possible to set up a Forecasted Profit and Loss Statement (Form #20). This form enables the management to know in advance the situation under which the business is about to be operated for the period under consideration. With regard to manufacturing costs, it has been the object of the thesis to expel the doubts ~~which~~ any one may have had about the reliability of standard manufacturing costs. ~~Once~~ Again it must be pointed out that standards are the best possible working conditions which may be lived up to, without destroying either moral fibre or one's conscience, ~~if attacked with the correct point of view in mind.~~

COLLECTION OF THE DATA

Form #19, the Sales Budget, has been explained in a previous chapter. From this form the totals appearing in the Forecasted Profit and Loss Statement (Form #20) in the columns headed "Sales List and Sales Net" are taken. The totals are taken by products and Net Profit is calculated by products. Material, Labor, and

Burden is calculated from the compilations of Standard Costs (Form #1) held in the cost department. In this manner the Total Factory Cost and Gross Profit are computed.

Form #21, the Distribution of Forecasted General and Selling Expense, shows a compilation of general or administrative costs as well as selling or distribution costs. The separation of these costs into fixed and variable expense is the first and usual step in their analysis. From this form the general and selling expenses are brought onto the Summarized Forecasted Profit and Loss Statement as a footing, or total, by months only, and not by products.

The Forecasted Profit and Loss Statement shown in Form #20 may be used as a yearly summary by substituting in the first column the designation "Months" in place of "Class of Product".

ADDENDUM

In retrospect it is hoped that the reader will understand that the body of the thesis endeavors only to establish the plausibility and comprehensiveness of standard costs in manufacturing, and to show the accounting procedure. Certain other things have been added to "complete the picture" such as the Forecasted Profit and Loss Statement.

APPENDIX

The appendix shows the use of all the forms called for in the main body of the thesis. Into each form figures have been inserted to show their application. In the case of the Bedaux forms a simple problem is carried thru the three forms to illustrate the fine points of each form.

STANDARD COSTS PER 100 PARTS OR ASSEMBLIES (FORM #1)

Part number 2084 performed in the cutting department of a garment manufacturing concern requires four labor operations #208, #212, #213 and #220 which are respectively, cutting the cloth into lengths after it has been folded, laying a pattern on and marking around the pattern, cutting the folds of cloth with a cutting machine along the lines marked out, and trimming away the rough edges. The base rates for each operation which are $.45, $.55, $.65 and $.50 respectively are Bedaux hourly rates to be applied against the like amounts of time or B's allowed to do the work which are the standards expressed in minutes. The extensions are the labor costs of each operation and the total ($.46) represents the total labor cost on part #2084 in the cutting department.

The material costs are found to be 25 feet of cloth #4027 @ $.20 per foot--total material cost $5.00.

Burden in the cutting department is standardized at $.60 per hour of standard labor. Since the total elapsed time in the department is 50.3 B's the total burden cost is $.50. Material, labor and burden is summarized (lower right) and total manufacturing cost in this department for part #2084 is found. If there had been any previous operations or assemblies the material and labor (including burden) cost would have been inserted in the

summary of costs opposite "Total Parts List".

LIST OF PARTS AND ASSEMBLIES (FORM #3)

This form is a summary sheet for parts cost. The one illustrated is #1 for Form and Code #4037/3819. It follows logically after Form #1 (above). It is assemblies list #1 for the cost of garment #3819 made from cloth #4037. The summarized information from Form #1 is listed on it.

Standard Costs per 100 Parts or Assemblies*

Description: Cutting Date Compiled 3/21/32 No. 2084

Oper. Seq.	Oper. No.	Description of Operation	Base Rate	B's per 100	Extension
1	208	Cut & Fold	.45	5.8	.04
2	212	Mark & Edge	.55	20.0	.18
3	213	Cut	.65	16.0	.17
4	220	Trim	.50	8.5	.07
		Totals		50.3	.46

Material				Summary of Costs				
Description	Quan. per 100	Std. Price	Std. Amt.		Rate	Labor	Mat.	Total
4027	25'	.20	5.00	Total as above		.46	5.00	5.46
				Total PartList Burden	.60	.50		.50
				Total		.96	5.00	5.96

Form #1

List of Parts and Assemblies*

Form and Code No. 4027/3819 No. 1

Part No.	Description	No. Req.	Cost per 100 Labor	Material
2084	Cutting	100	.96	5.00
	Total			

Form #2

*Adapted from G. Charter Harrison's "Standard Costs".

STATE WHETHER NEW INSTALLATION, REPLACEMENT INSTALLATION, REPAIR, OR EXPERIMENTAL WORK, OR WHETHER A CHANGE OR BLEACH EXPENSE ITEM, ETC.

FORM 102 15M 11-30 ORDERS AND INSTRUCTIONS VALID ONLY WHEN WRITTEN ON PROPER FORM.

PURCHASE REQUISITION

THE WILLIAM CARTER CO.
NEEDHAM HEIGHTS, MASS.

Please order the following: Date 3/21/32

Recommended to be bought from Laycock and Burns, Inc.

Mill No. 3 For Dept. Knitting Street and No. 408 Harris Street

To be used for Knitting City New York State N. Y.
Use space on form below for additional explanation.

When wanted Rush If "Rush" how do you want shipped Freight Terms 2/10/FM
State P. P., Fgt., Exp., etc.

QUANTITY	DESCRIPTION	COST Estimated	COST Actual
100lbs.	60 D/2047 Rayon Yarn @ .60	60.00	

Give actual or estimated cost

O. K. K.F.G. Pur. Dept. T.P.S. Signed F.H. Burncoat

(This space below double lines to be reserved)

3/22/32 Date of Order 5065 Order No. Approved L.F.C. THE WILLIAM CARTER CO.

Form #3

(By permission of the William Carter Co.)

Form No. 48-2000-6-31-B&B

PURCHASE ORDER

№ 5065

ALL PACKAGES AND INVOICES MUST BEAR ABOVE NUMBER. INVOICES NOT SHOWING IT WILL BE RETURNED.

MARK FOR DEPARTMENT

IMPORTANT
MAIL ORIGINAL INVOICES TO NEEDHAM HEIGHTS, MASS.
MAIL DUPLICATE INVOICES TO SPRINGFIELD, MASS.

SHIP AT ONCE UNLESS OTHERWISE STATED BELOW TO
33 MORRIS ST., SPRINGFIELD, MASS.

Carter's Underwear

REG. U.S. PAT. OFF.

THE WILLIAM CARTER COMPANY

NEEDHAM HEIGHTS, MASS.

TO Laycock and Burns, Inc.
408 Harris Street
New York, N. Y.

VIA Freight TERMS 2/10/FM

100 lbs.	60 D/2047	Rayon Yarn	@	.60	$60.00

IMPORTANT NOTICE

TO FACILITATE THE WORK OF OUR ACCOUNTING DEPT. IT IS UNDERSTOOD THAT IN ACCEPTING THIS ORDER YOUR BILL IS SUBJECT TO OUR REGULAR DISCOUNT TERMS THE 10TH OF SECOND MONTH FOLLOWING SHOULD IT BE RECEIVED IN THE MAIL BY US AFTER THE 25TH OF ANY MONTH. INVOICES AFTER THE 25TH OF THE MONTH WILL BE CONSIDERED AS DATING THE FIRST OF THE FOLLOWING MONTH.

APPROVED
L.F.C.

THE WILLIAM CARTER COMPANY
BY T. J. Denton

Form #4

(By permission of the William Carter Co.)

INVOICE STAMP (FORM #5)

In order to have a place on each invoice where certain essential information may be recorded a rubber stamp such as is illustrated here is used on the invoice. Then as the invoice goes thru the regular channels the ~~necessary~~ required information is inserted in the proper places. In the illustration the goods were purchased on order #5065; charged to material account #3 in the standard amount of $58.00; charged to freight account #29--$1.31; approved as to terms, received (and date of receipt) and price; entered on stock records; approved by the auditor (W. T. T.); approved and checked in the accounting department as being in good order (O. H.); and finally entered in the voucher register (Voucher 298).

Mill No. 2	
Pur. Ord. No. 5065	Voucher No. 298
Chg. Acct. No. 3	Std. Amt. $58.00
Frt. Acct. No. 29	Frt. Amt. $ 1.31
Received J. T.	Date Received 3/31/32
Figured K. L.	Price O.K. T.J.D.
Terms O.K.	Entered by F.S.
Approved W.T.T.	Checked by O.H.

Form #5

Invoice Stamp

CYCLE SHEET TICKETS (FORM #6)

In the 14th week of the year 1932 at Mill #3 certain cloth is to be knitted. 500 feet in the quantity of 50 feet on each shop order number and of size 2 is to be knitted. It is to be of 1st quality rayon yarn. When it becomes cloth its code number will be 5122. The cloth will be used to make garments of form #2148. Since the shop order quantity is 50 feet there will be 10 shop orders and their numbers are consecutive from #201 to #210. In the same manner all the cloth that is to be knitted at Mill #3 in the 14th week of 1932 is listed. The list serves as an order to manufacture going from the planning and production department in the main office to the mill where shop order tickets are made out to cover the orders.

DATE 3/21/32

CYCLE SHEET-TICKETS

CYCLE NO. 14

MILL NO. 3

marks	Total	S. O. Q't'y	Size	QUALITY	Code No.	Form No.	No. of S. O.	NUMBERED		Paper Box No.
								From	To	
	500	50	2	1st Rayon	5132	2148	10	201	210	

Form #6

(By permission of the William Carter Co.)

SHOP ORDER TICKETS (FORM #7)

This form is made out for 15 dozen of size 5 article #3433/39. The order of departmental operations is reversed, i.e., reads from bottom to top beginning with C & F (cut and fold) thru Fold (fold and inspect the garments). The order of operations is in duplicate since the tickets must be clipped off by each operator as each operation is performed and stuck onto the operators coupon sheet. The first ticket has been removed and placed just below the master ticket. Order number, dozens and code number (signifying the manner of carrying thru the operations) is repeated on each ticket. Where no Bedaux rate is given the operator works on an hourly basis.

25% WOOL -75-

C
Box Number

Firsts	Seconds	Shortage

Dozen 15 5 Size 3423/39 Article Color

012103 15 2559

25% WOOL C

Seconds Tag

Dozen 15 5 Size 3423/39 Article Color Quant'y

Form	Op. No.	Boxing	Order Number	Doz.	Code No.	Rate
1095		106 W	012103	15	2559	2559
Fold		Fold	012103	15	2559	4.0
IG		IG	012103	15	2559	4.4
ING		ING	012103	15	2559	
Measure		Measure	012103	15	2559	
InspLabel		InspLabel	012103	15	2559	0.27
DrEnds		DrEnds	012103	15	2559	2.3
Rib&But		Rib&But	012103	15	2559	11.8
SewBut		SewBut	012103	15	2559	5.4
Bud		Bud	012103	15	2559	1.4
Merrow		Merrow	012103	15	2559	5.3
SewTube		SewTube	012103	15	2559	9.6
Tack		Tack	012103	15	2559	3.0
BH		BH	012103	15	2559	6.0
Label		Label	012103	15	2559	1.8
TubeNk		TubeNk	012103	15	2559	5.0
EdgeFront		EdgeFront	012103	15	2559	3.1
ButStay		ButStay	012103	15	2559	4.5
BHStay		BHStay	012103	15	2559	5.3
FLSeam		FLSeam	012103	15	2559	14.5
Shldr		Shldr	012103	15	2559	2.5
Trim		Trim	012103	15	2559	0.64
Cut		Cut	012103	15	2559	0.64
Mark&Edge		Mark&Edge	012103	15	2559	2.5
C&F		C&F	012103	15	2559	

Form #7

(By permission of the William Carter Co.)

MATERIAL SPECIFICATIONS (FORM #8)

Each form and code number has a standardized material specifications card such as the one illustrated. On it all the necessary information to properly manufacture the article is found. In the case of form and code #411/2017 the material to be used is silk of quality #2 which is to be dyed pink (color #124 on the standard color card). 450 feet of 26 inch cloth is allowed to manufacture 100 pieces. The standard price per foot is $.43. It is to have a special trim (#129 from a list of standard trims) and full edge (technical term.) A copy of each material specifications card is held at the plant office as well as in the planning department.

Material Specifications (per 100 pieces)

Date Compiled 2/29/32 Form and Code No. 411/2017

Kind of Material Silk (2)

Special Processes on Material Dyed pink (124)

Standard Material Quantity 450' of 36" cloth

Standard Material Price $.43 foot

Remarks: Special trim (139). Full edge

Form #8

43M 8-31 F.P.Co.

REQUISITION

lease ship and
harge to
ILL No. 3
: Knitting

Form & Code No. 413/6297
Shop Ord. No. 314823

Date 3/21 1933

Mill Serial No. S 1143

antity anted	Quantity Shipped	Description of Goods	Price
101bs		#219 Worsted Yarn @ .80	320.00

ved by	Posted by	Filled by	Mill No.	Date	Shipped Via	Acct'g Dept.
C.B.T.	L.F.	Q.S.	3	3/21/33		

Form #9

(By permission of the William Carter Co.)

MATERIAL VARIATIONS (FORM #10)

On the analysis of material variations for Plant #2 for the week ending 3/26/32 Form and Code #411/2122 shows a variation from the standard of $5.75 (difference between the standard cost $52.30 and the actual cost $58.05). The cause of the difference was poor needles and the department in which the cause occurred was the knitting department. Since the standard shop order quantity is 100 then in the knitting of 100 feet of cloth poor needles caused an extra cost of $5.75 and probably the purchasing department would be held responsible for buying poor needles. In the same or a similar manner all material variances may be tabulated and causes discovered. The information is taken from the individual material requisition (see Chapter V).

Plant No. 2 Standard Shop Order Quantity 100

Analysis of Material Variations by Form and Code No. and by Causes Week End. 3/26/32.

Causes	Dept. at Fault	Shop Order No.	Form & Code No. 411/2122 Standard	Form & Code No. 411/2122 Actual	Form & Code No. Standard	Form & Code No. Actual	Form & Code No. Standard	Form & Code No. Actual
Needles	Knit	214232	52.30	58.05				
Sub-Total								
Sub-Total								
Sub-Total								
Sub-Total								
TOTALS								

Form #10

PROBLEM ILLUSTRATING USE OF BEDAUX FORMS--NUMBERS 11, 12, & 13

For the purpose of illustrating the use of the three Bedaux forms a hypothetical department in a hypothetical manufacturing plant will be brought into existence on paper and certain logical facts will be assumed.

The department has the following personnel:

15 Direct workers

1 Helper and sweeper @ $15.00 per week

1 Machinist @ $30.00 per week (one-fourth of his time is charged to this department).

1 Foreman @ $30.00 per week

One-sixth of the salary of the superintendent is charged to this department. His salary is $90.00 per week. Three of the direct workers are novices and their base pay is 30¢ per hour or 60 B's (Bedaux points). Six of the direct workers have a base pay of 40¢ per hour and six have a base pay of 44¢ per hour. The working hours are from seven twenty to twelve noon and from one to five in the afternoon. A forty-eight hour week for five and one half days' work.

The name of the department is the "Labeling Department" and the direct workers all sew labels on garments throughout each working day. The labels are sewed on by machine. The machinist is available to fix broken down machines. The helper carries work to and from the direct workers and keeps the place clean and cleared of waste material. The foreman is of general assistance and is required to watch the quality of the work.

A coupon sheet (Form A) is shown for operator #5 for the

Coupon Sheet for Operator #5

3/21/32

190-75M-1-31 MPC

TIME CLOCK	
A. M. In	7:20
Noon Out	12:00
Noon In	1:00
P. M. Out	5:02

COUPONS	B's
Label 212418 10 4027 2.6	26
	35
	34
	22
	28
	56
	17
	12
	28
	26
	45
	22
	58
	76
Total	475

(1) Total Mins.	500	Total Hrs.	8 1/3
Ind. Mins.		Total B's	475
U. M. Mins.	30	Less (1-2)	425
A. T. Mins.	45	Prem. B's	50
Total (2)	75	Hrs. on B Val.	
Premium	$.25	B. Hour	67

ALLOWED TIME AND UNMEASURED WORK

Cause			
Broken		Finish	8:45
machine		Start	8:30
O. K.		Diff.	15

Stick Coupons For Allowed Time and Unmeasured Work Here

Cause			
Wait for		Finish	2:45
work. (Dept not re-		Start	2:15
O. K. sponsible)		Diff.	30

Stick Coupons For Allowed Time and Unmeasured Work Here

Cause			
Special work		Finish	4:40
see coupon		Start	4:30
O. K.		Diff.	10

Label 212900 1 5555

Unmeasured Work Here

Cause			
Special		Finish	5:00
work (no rate)		Start	4:40
O. K.		Diff.	20

Label 212901 1 5556

Unmeasured Work Here

DO NOT STICK COUPONS IN HERE

Form #11 (Form A)

(By permission of the William Carter Co.)

first day of the week we are considering. A coupon is shown in the place where it was stuck by the operator after completing her first job of the day. The coupon was clipped from a shop order ticket similar to form #7. The operation name, order number, number of dozens, code number and Bedaux rate were already on the shop order ticket when it came to her attached to the garments to be worked on. As the coupon indicates, the work consists of ten dozen garments of style or code number 4027 which are being processed at Mill 2 in the twelfth week of the year on order number 418 (see Chapter on Bedaux Forms). The rate or time allowed to do this particular operation is 2.6 minutes or B's per dozen. Therefore, the total B's earned for that particular job is 26 B's. In the same way coupons for every job done through the day are stuck on the coupon sheet (the backs of the shop order tickets are gummed for that purpose). At the end of the day the coupon sheet is turned in. The B's earned and all other calculations are made in the plant office. Under the caption Allowed Time and Unmeasured Work there are spaces for the declaration of idle time, allowed time and unmeasured work. For a description of what these may consist of see the chapter called "Method of Renumeration and Analysis Under the Bedaux System". If special work is done for which special Bedaux rates are set, the stickers or coupons are placed in the space allotted for allowed time and unmeasured work.

Other coupons would be inserted on the coupon sheet by our imaginary operator. For the purpose of showing how the system works, the total B's earned per operation only have been shown here. The spaces for allowed time and unmeasured work have ex-

amples of their possible uses. The coupon sheet is shown completed as the office workers would figure it.

The number of B's earned for each operation are extended and the total B's earned for the day are, in this case, 475. This is inserted in the calculation space (upper right). The unmeasured minutes (30) and the allowed time minutes (45) are taken from the designated spaces below, each of which bears the foreman's approval (encircled). The total (2) of allowed time and indirect minutes is subtracted from the total (1) minutes worked and placed in the space "Less (1-2)". The figure is 425 in this instance. The premium B's are then calculated by deduction of this figure (which represents the total minutes spent on Bedaux work) from the total B's earned (475. Premium B's in our problem for operator #5 amount to 50. Her base pay is 40¢ per hour and the premium is calculated and put in the space "Premium". Since, as we have seen, the direct worker only receives three-fourths of the premium earned, this operator receives three-fourths of fifty minutes' time at her base rate ($.25).

The "Hours on B Value" is the number of minutes on work having a Bedaux rate which appears opposite "Less (1-2)" and is 425 (in this case) divided by sixty. The "Hours on B Value" for operator #5 for the day under consideration is 7-1/12. The "B Hour", or average number of B's earned per hour while working on operations having a Bedaux rate, is found by dividing the total B's earned (475) by the hours on B value (7-1/12) and the result is 67. Therefore, this operator did considerably better than the required 60 Bedaux points average per hour.

Operators #5 through #10 are paid a base rate of 40¢ per hour; operators #11 through #16 are paid 44¢ per hour and opera-

tors #17 through #19 receive 30¢ per hour.

The information obtained through the calculations made on the coupon sheet are carried forward to the posting sheet (Form B). The information derived for operator #5 appears in the proper columns and is circled. That information is:

1. Total hours worked	8-1/3
2. B's made	475
3. B Hour (Aver. B's per hr.)	67
4. Premiums earned	$.25
5. Allowed time (minutes)	45
6. Unmeasured work "	30

In the same way the same information for every operator for every working day is obtained and brought forward to the posting sheet. The base rates of pay are inserted. Then Base earnings are calculated. Base earnings appear as two amounts for each operator and are calculated in the following manner: Multiply the total unmeasured work and allowed time for the week by the base rate. In the case of operator #5 it is 210 minutes plus 170 minutes or 6-1/3 hours times base rate of 40¢ equals $2.53. The result is the cost of idle time and unmeasured work and must be charged on the records to indirect labor. The remaining hours worked are multiplied by the base rate (for operator #5 - 41-2/3 hours by 40¢ equals $16.67). The "Base Earnings" column is footed in two amounts also, $20.25 being charged to Indirect Labor for the week for the department and $226.05 to Direct Labor.

"Premium Earnings" for each operator for the week are obtained by adding the daily premium earnings. The total of this column must be charged to the account "Direct Labor--Premiums" on the payroll summaries. B's must be cross-added to obtain a

.CO. FORM 180 11-31 B&B

Depart

	Clock NO.
	5
	6
	7
	8
	9
	10
	11
	12
	13
	14
	15
	16
	17
	18
	19

Form #12 (Form B)

(By permission of the William Carter Co.)

:.CO. FORM 100 11-31 B&B

THE WILLIAM CARTER CO.
POSTING SHEET.

Department LABEL **Mill No.** 2 **Week Ending** 3-26-32

Clock NO.	NAME	Base Rate	Total Hours	Base Earnings	Premium Earnings	Total Earnings
5		40	48	2.53 16.67	1.20	20.40
6		40	48	1.60 17.60	.65	19.85
7		40	48	1.80 17.40	.15	19.35
8		40	21	.80 7.60	.60	9.00
9		40	48	1.80 17.40	.45	19.65
10		40	48	1.80 17.40	.70	19.90
11		44	29 1/3	.59 12.32	.50	13.41
12		44	48	2.20 18.92	1.25	22.37
13		44	33 1/3	1.69 12.97	.50	15.16
14		44	48	2.38 19.12	-	21.12
15		44	37 2/3	.73 15.84	.75	17.32
16		44	48	.88 20.24	.30	21.42
17		30	29 1/3	.70 8.10	1.20	10.00
18		30	37 1/3	.55 10.65	.65	11.85
19		30	48	.60 13.80	.15	14.55
	TOTALS		620	20.25 226.05	9.05	255.35

Clock NO.	HOURS Mon	Tues	Wed	Thurs	Fri	Sat	B's Mon	Tues	Wed	Thurs	Fri	Sat	Total
5	1	1	1	1	1	1	475	480	470	450	490	235	2600
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
6	1	1	1	1	1	1	450	470	440	480	485	240	2565
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
7	1	1	1	1	1	1	425	430	425	435	420	250	2385
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
8	1	1	-	-	-	1	495	460	-	-	-	255	1210
	8 1/3	8 1/3				4 1/3							
9	1	1	1	1	1	1	455	460	465	450	445	245	2520
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
10	1	1	1	1	1	1	460	455	465	475	485	235	2575
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
11	1	1	1	1	-	-	490	485	490	255	-	-	1720
	8 1/3	8 1/3	8 1/3	4 1/3									
12	1	1	1	1	1	1	470	465	480	485	480	250	2630
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
13	1	1	4	4	1	1	450	440	210	215	495	250	2060
	8 1/3	8 1/3			8 1/3	4 1/3							
14	1	1	1	1	1	1	430	440	420	430	435	240	2395
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
15	1	1	1	1	1		500	505	515	245	505	-	2270
	8 1/3	8 1/3	8 1/3	4 1/3	8 1/3								
16	1	1	1	1	1	1	480	485	490	475	470	245	2645
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
17	1	1	1	4	4	1	485	280	240	235	245	250	1735
	8 1/3	4 1/3	4 1/3			4 1/3							
18	1	1	4	1	1	-	490	490	230	485	485	-	2180
	8 1/3	8 1/3		8 1/3	8 1/3								
19	1	1	1	1	1	1	495	475	465	455	450	235	2575
	8 1/3	8 1/3	8 1/3	8 1/3	8 1/3	4 1/3							
TOTALS							7050	6820	5805	5570	5890	2930	34065

Clock NO.	B HOUR Mon	Tues	Wed	Thurs	Fri	Sat	Av	PREMIUM M	T	W	T	F	S
5	67	68	66	63	67	59	65	25	30	25	15	25	-
6	56	63	59	64	65	60	61	-	25	-	20	20	-
7	57	57	57	58	56	63	58	-	-	-	-	-	15
8	66	62	-	-	-	64	64	25	15	-	-	-	20
9	61	61	62	60	59	61	61	10	10	15	-	-	10
10	61	61	62	63	65	59	62	10	10	15	15	20	-
11	61	61	61	64	-	-	62	10	10	10	20	-	-
12	63	62	64	65	64	70	65	15	15	20	20	20	35
13	60	59	60	61	66	63	62	-	-	-	10	25	15
14	57	59	56	57	58	60	58	-	-	-	-	-	-
15	63	63	64	61	63	-	63	15	15	20	10	15	-
16	60	61	61	59	59	61	60	-	10	10	-	-	10
17	61	70	60	67	70	63	65	10	35	-	25	35	15
18	61	61	66	61	61	-	62	10	10	25	10	10	-
19	62	59	58	57	56	59	59	15	-	-	-	-	-

Clock NO.	ALLOWED TIME M	T	W	T	F	S	Total	UNMEASURED WORK M	T	W	T	F	S	Total
5	45	30	45	40	30	20	210	30	45	30	35	30	-	170
6	20	40	30	10	50	20	170	-	10	20	40	-	-	70
7	40	20	30	50	20	-	160	10	30	20	-	30	20	110
8	30	40	-	-	-	20	90	20	10	-	-	-	-	30
9	20	50	20	30	40	20	180	30	-	30	20	10	-	90
10	50	50	50	20	30	-	200	-	-	-	30	20	20	70
11	20	20	20	20	-	-	80	-	-	-	-	-	-	-
12	50	50	20	20	20	20	180	-	-	30	30	30	30	120
13	40	40	10	30	20	10	150	10	10	20	-	30	10	80
14	20	40	30	10	30	20	150	30	10	20	40	20	-	120
15	20	10	20	20	20	-	90	-	10	-	-	-	-	10
16	20	10	20	20	20	20	110	-	10	-	-	-	-	10
17	20	20	20	20	20	20	120	-	-	-	10	10	-	20
18	20	20	20	20	20	-	100							
19	20	20	20	20	20	20	120	-	-	-	-	-	-	-
TOTALS							2110							910

Allowed Time Department Not Responsible	
Mon	150
Tues	130
Wed	120
Thurs	140
Fri	160
Sat	100
Total	800

Penalty B's
Mon
Tues
Wed
Thurs
Fri
Sat
Total

Black=Reward
Red =Penalty

B 1/5 To Equal 60

weekly total for each operator. "Allowed Time-Department Responsible" is obtained by adding the amounts so designated on each coupon sheet for each day. "Penalty B's" occur rarely but may be inflicted on a department as a whole if work which has been spoiled in that department causes another department some loss of time. This is discretionary and should be left to the judgment of the person in charge of Bedaux Standards.

WEEKLY BEDAUX ANALYSIS REPORT

The information on the posting sheet is brought forward to the Weekly Bedaux Analysis Sheet (Form C). The first column on this report is for the department name; the second is for the department supervisor's name; the third is for the number of employees in the department; the fourth is for the number of employees who failed to average the required 60 Bedaux points per hour during the week; the fifth is for the total number of hours on work having a B Value by all operators in the department (this is obtained by deducting the total allowed time plus the total measured minutes from the total hours worked by all employees in the department (in this case 620 hours less 50-1/3 hours or 569-2/3 hours). The sixth and seventh columns are for lost hours - department responsible and department not responsible. The latter is taken from the posting sheet and the former is obtained by deducting the lost hours department not responsible from the total allowed time plus the total unmeasured work (in this case, 50-1/3 less 13-1/3 equals 37). "Total Hours" is the total of hours worked by all direct operators in the department. "Direct B's" is the total B's earned by the department. "Penalty B's" is the total taken from the posting sheet. "Net Total B's" is the "Direct B's" total less "Penalty B's". The following formulae

FORM M46

MILL NO.

DEPT.	SUPERVIS NAME
LABEL	

ANALYSI

DEPT	Direct La	
	On Bed.	Un
LABEL	235.10	

FORM M46

COMBINED WEEKLY BEDAUX ANALYSIS REPORT

MILL NO. 2 — WEEK ENDING 3-26-32

DEPT.	SUPERVIS. NAME	EMPLOYEES TOTAL	EMPLOYEES Bel. 60 BHr.	DIRECT LABOR ON BEDAUX Hrs. on BVal.	Lost Hrs. Dept Res.	Lost Hrs. Dept Not Res.	Tot. Hrs.	DIRECTB'S	Pen-alty B's	NET TOTAL B's	Dir. B Hr.	INDIR. LABOR Total Hrs.	EAC = 23 Total Indir. B's	Ind. B Hr.	Tot. B Hr.	Cost Stan $	EFF'NESS Sup.	EFF'NESS Dept
LABEL		15	3	569 2/3	37	13 1/3	620	34065	-	34065	55	116	7835	68	57	1.12	53.	51.

DEPT	ANALYSIS OF PAY ROLL Direct Labor On Bed.	Direct Labor Unmsd.	Indir. Labor	Total Payroll	Total Loss	COST PER 1000 B's Direct	Indir.	Total	ANALYSIS OF INDIRECT LABOR HOURS Sup'vis Act	Sup'vis All	FOREMAN Act	FOREMAN All	MACH'ST Act	MACH'ST All	GENERAL Act	GENERAL All	DIR LAB Act	DIR LAB All	Total Act	Total All	%	Memoranda Unm. Hrs	Prem. Res've
LABEL	235.10	6.24	14.00 67.50	322.85	34.07	6.91	2.37	9.28	15.00	15.00	30.00	30.00	7.50	7.50	15.00	20.00	14.01	—	81.51	72.50	2.4	15	3.02

FORM 13

explain calculations involved in finishing the amounts for the remaining columns with the figures from this problem:

$$\text{Direct B Hour} = \frac{\text{Net Total B's (34065)}}{\text{Total Hours (620)}} = 55$$

Total Hours Indirect Labor (actual) = 116

Total Indirect B's = Factor x Direct B's (.23 x 34065) = 7835

Factor--Proportion of indirect minutes allowed to productive minutes based on time study.

$$\text{Indirect B Hour} = \frac{\text{Total Indirect B's (7835)}}{\text{Total Indirect Hours (116)}} = 68$$

$$\text{Total B Hour} = \frac{\text{Net Total B's plus Total Indirect B's (34065 plus 7835)}}{\text{Total Direct Hours Plus Total Indirect Hours (620 plus (116)}} = 57$$

$$\text{Direct Cost per 1000 B's} = \frac{\text{Total Direct Labor Cost \$235.20}}{\text{Net Total B's (x 1000) (34065)}} = \$6.91$$

$$\text{Indirect Cost per 1000 B's} = \frac{\text{Cost of Indirect Labor (\$6.24 plus 14.01 plus 67.50)}}{\text{Net Total B's plus min. of Unmeas. Work (x 1000) (34065 plus 910)}} = \$2.53$$

$$\text{Total Cost per 1000 B's} = \text{Direct Cost per 1000 B's plus Indirect Cost per 1000 B's (\$6.92 plus \$2.53)} = \$9.44$$

$$\text{Cost per Std. Dollar} = \frac{\text{Total Cost per 1000 B's \$9.44}}{\text{Std. Cost per 1000 B's (Total) \$8.44}} = \$1.12$$

(See Chapter IX for explanation of the Cost per Std. Dollar and Standard Cost per 1000 B's)

$$\text{Departmental Effectiveness} = \frac{\text{Total B Hour (57)}}{\text{Cost per Std. Dollar (1.12)}} = 51$$

$$\text{Total Losses} = \text{(Cost per 1000 B's of work minus Std. Cost per 1000 B's) x 1000's of Total B's(\$9.44 - \$8.44) x 34.065} = 34.07$$

$$\text{Total Cost} = \text{Total Direct Labor Cost on Bedaux plus Indirect Labor Cost (\$235.10 plus \$87.75)} = \$322.85$$

$$\text{Cost per Std. Dollar corrected for Cost of Dept. Not Respon. Hrs.} = \text{Cost of Standard Dollar x (Total Cost minus Cost of Lost Hours) \$1.12 x (\$322.85 minus \$5.60)} = \$1.10$$

$$\text{Adjusted Total B Hr.} = \frac{\text{Total B's (Direct and Indirect)(34.065 plus 7835)}}{\text{Total Hours minus Lost Hours Department not Responsible (736 minus 13-1/3)}} = 58$$

$$\text{Supervisional Effectiveness} = \frac{\text{Adj. Total B Hour (58)}}{\text{Adj. Cost per Std. Dollar (1.10)}} = 52.7$$

Under "Analysis of Payroll" the first two columns show the amounts paid to direct operators "On Bedaux Work" and for "Unmeasured Work". The column "Indirect Labor" contains two amounts; the amount paid direct workers for idle time and allowed time, and the total of the regular direct labor payroll including the foreman, helper and sweeper, a proportion of the amount paid the machinist and a proportion of the supervisor's salary.

"Analysis of Indirect Labor Hours" compares the actual with allowed cost of indirect labor. The column "Direct Labor" shows the amount paid to direct operators for idle time or allowed time.

The heading "Memoranda" provides space for the total hours on unmeasured work and the per cent of unmeasured hours compared with the total hours of the direct operators. The premium reserve may be calculated for the week by dividing the total premiums earned ($9.05) by .75 and dividing the result by 4 (the amount is $3.02) in this case. This is done because $9.05 represents the amount paid to direct workers but it is only 75% of the total premium earned. The remaining amount ($3.02) should be credited to the Premium Reserve account and charged to Direct Labor--Premiums. If at the end of the month the supervisional effectiveness of the department averages above 60, let us say 63, for example, then each indirect worker receives a bonus of 3 points or one-twentieth of an hour for each hour worked at the average base rate for direct operators in the department. The average base rate should be an average weighed by the hours

worked during the month by each direct operator.

CONCLUSIONS:

It is evident that this hypothetical department had too many lost hours. Either the work was not brought to them promptly or there were too many machine breakdowns or some such trouble kept the direct workers from working as steadily as they could. There were quite a few lost hours for which the department was not responsible, but the bad effect of this was corrected in figuring supervisional effectiveness. It is possible that if the work was not brought to the workers rapidly enough that another helper at least part of the time might clear up the difficulty. Of course this report cannot definitely point to the cause of the failure, but it can point out that there is a situation which needs attention.

Note: The method of calculating base earnings used in this problem varies slightly from the method described in Chapter IX, but the variance is very small. If the method taken in the problem were to be used in practice, the variance would show up in the Direct Labor account and the charges to that account from the payroll would not agree with the credits on the monthly journal entry made by the Cost Department. This has no appreciable effect on the results obtained from the Weekly Bedaux Analysis Report about which attention centers in this problem.

MACHINE DATA (FORM #14)

This form shows the detailed information necessary for every machine for the compilation of burden data. A Universal Cutter costing $250.00 machine #219 is located at Mill #3 at 2-21S-24E (general map plans which means 2nd floor 21 feet from the south wall and 24 feet from the east wall). The complete use of the machine requires 16 square feet altho the actual floor space the machine takes up may be much less than that. The remaining data on the card is self-explanatory.

DEPARTMENTAL MACHINE ANALYSIS (FORM #15)

The information on the machine data cards is transferred to this form. Interest charged to cost is figured at 6% per anum on total cost. All calculations are made on a monthly basis since standard burden entries are on that basis. Depreciation is calculated on total cost at the rate assigned to each machine. The number of hours the machine is expected to be operated during each month is inserted as the Standard Machine Hours per month. Kilowatt hours expected to be consumed is obtained by multiplying the rate of consumption by the number of hours the machine will be operated. Set-Up Labor in the case of a cutting machine in a garment factory is the number of times the knife blade must be changed either because it is worn out or because a different kind of blade must be used on different kinds of cloth. The cost of set-up labor is derived by calculating the standard time necessary to make a different set-up and multiplying by the hourly rate of the operator or machinist who makes the change. In the case of a cutting machine the cost is relatively small but with some other kind of machine the cost might be a considerable item. Repair and tool costs are estimated on a yearly basis and the monthly proportion assigned on the machine analysis.

Machine No. 219

MACHINE DATA* Mill No. 3

Department Cutting Location 2-21S-24E

Description Universal Cutter 18"

Original Cost $250.00 When Purchased 2/1/31

Installation Cost

Rate of Depreciation 10% yearly

K. W. Consumption 5.5 per hour

Floor Space 16 square feet

Machine Group 21

Remarks:

Form #14

Dept. No. 18

DEPARTMENTAL MACHINE ANALYSIS*

Dept. Name--Cutting

Machine Name	Mach. Group	Mach. No.	Cost	Int. Chgd to Cost	Depre. Data Rate	Depre. Data Amt.	Std. Mach. Hrs. Mo.	Power K.W. Con.	Power KWHrs. Mo.	Set-Up Labor No.	Set-Up Labor Cost	Repairs	Tools
Universal	21	219	250.00	1.25	10	3.08	176	5.5	968	25	5.00	3.50	2.00
Totals													
Calculations													

Form #15

*Adapted from G. Charter Harrison's "Standard Costs"

STANDARD EXPENSE SCHEDULES (FORM #16)

Standard expense schedules are established for the power department, the machine shop, departmental expense analyses, general factory expense analysis and floor space expense analysis. These are all identical in form. The form illustrated for power expense is typical. The standard unit is the kilowatt hour. The total standard units in a standard month is calculated by multiplying the number of hours each machine is operated by its hourly kilowatt requirement and adding the results obtained. In this case there were 33 machines requiring 2.5 K.W. per hour for 176 hours. The account class column signifies that the item of expense is variable (v.) or fixed (f.). The number of hours in a standard month is required for all persons working in the department since some may only work a part of their working hours in that department and the remainder elsewhere. The standard cost per unit is obtained by dividing the total cost per standard month by the total standard units in a standard month. It is the cost per kilowatt hour in the case of the power department.

STANDARD EXPENSE SCHEDULE * Mill #3

POWER

Standard Unit - K. W. Hour Total Standard Units in Std. Month 14,520

Account Name	Acct No.	Acct Class	Description	No. of Persons	No. of Hrs. in Std. Mo.	Standard Cost Per Month	Standard Cost Per Unit
Coal	14	V				200.00	
Water	301	V				56.00	
Payroll	212	F	Engineer and Assistant	2	176	220.00	
"	212	F	Fireman and Electrician	2	176	192.00	
Supplies	324	V				12.00	
Lubricants	334	V				8.00	
Flr. Space	8	F	Insurance, Taxes, Depreciation Interest, Maintenance, Etc.			45.00	
TOTALS						733.00	.0505

Form #16

* Adapted from G. Charter Harrison's "Standard Costs"

SUMMARY OF MACHINE AND BENCH HOURS (FORM #17)

The power consumption per month and the floor space occupied by each department must be calculated in the setting up of the burden entries. In the form illustrated there were five machines in the cutting department which were operated 176 hours each month- a total of 880 machine hours. The power consumption of each machine is 3.5 kilowatts per hour, therefore the total standard power consumption in this department will be 3300 kilowatt hours. The department occupied 3460 square feet of floor space. In the same manner the same information is found for each department.

Summary of

Machine and Bench Hours*

Power Consumption and Floor Space

	Department	Machine Hours	Power Consump. in K.W.Hrs.	Floor Space
1	Cutting	880	2300	2460
2	Finishing	1760	4400	4400
3	Folding	1408		2613

Form #17

*Adapted from G. Charter Harrison's "Standard Costs"

ANALYSIS OF BURDEN VARIATIONS (FORM #18)

As the chapters on burden indicated the total credits to the departmental burden accounts by months represents the standard burden cost and the total debits represents the total burden cost (estimated) for the articles produced. This form simply collects the total credits and the total debits by months for comparative purposes. In addition the following accounts may be compared: Standard General Factory Expense, Standard Power Expense, Standard Machine Shop Expense and Standard Floor Space Expense. In the case of the latter accounts the total monthly debits represents actual burden expense and the total monthly credits represents the standard burden expense. The unit in the case of manufacturing departmental burden costs would be the hourly departmental cost (recorded for each department in the cost department).

When a very great variance occurs it is a warning signal that either production has fallen off or that costs have gone up and should be watched.

Plant No. 3

ANALYSIS OF BURDEN VARIATIONS UNITS HOURLY DEPT. COST JAN. TO MAR. 1932

	January		February		March		Totals	
	Stand. Journal Entry	Burden Charged to Cost	Stand. Journal Entry	Burden Charged to Cost	Stand. Journal Entry	Burden Charged to Cost	Stand. Journal Entry	Burden Charged to Cost
Knitting	1224.96	1008.28						
Cutting	686.40	680.20						
Finish	2069.76	1995.40						
TOTALS								
Gen.Fact.Exp	495.00	568.00						
Power Exp.								
Machine Shop								
Floor Space								

Form #18

SALES BUDGET *

Class

January to March 1932

Symbol No.	List ** Price	Standard Cost Per 100		January				February				March			
		Mater'l	Labor	No.	List Value	Stand. Cost Mat.	Stand. Cost Labor	No.	List Value	Stand. Cost Mat.	Stand. Cost Labor	No.	List Value	Stand. Cost Mat.	Stand. Cost Labor
419	2500.00	1250.00	482.00	50	1250.00	625.00	241.00								
Total List															
Less Discount															
Total Net															

Form #19

* Adapted from G. Charter Harrison's "Standard Costs"

**Per 100 Dozen Throughout

FORECASTED PROFIT AND LOSS STATEMENT *

Year 1932 Month of January

Class of Product	Sales List	Sales Net	Manufacturing Cost				Gross Profit	Operating Expense			Net Profit
			Material	Labor	Burden	Total		Admin.	Selling	Total	
A	23,500	21,150	8,568	3,192	3,690	15,450	5,700				
B	12,100	10,890	4,125	2,200	2,020	8,345	2,545				
C	28,400	25,560	8,940	5,100	5,380	19,420	6,140				

Form #20

DISTRIBUTION OF FORECASTED GENERAL AND SELLING EXPENSE *

Mon.	Forecasted Net Sales		Gen.& Admin. Expense			Selling & Dist. Expense		
	Amount	% of Total	Fixed	Variable	Total	Fixed	Variable	Total
Jan.	7950.00	13.8	891.00	2054.00	2945.00	1856.00	3149.00	5005.00

Form #21

*Adapted from G. Charter Harrison's "Standard Costs"

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Reports of systems actually installed by Scovell, Wellington & Company were consulted with the permission of Mr. F. L. Fletcher, formerly of that concern.

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